MARCH
1914

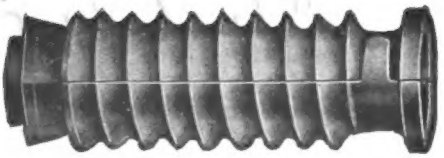
PRICE
15 CENTS

MODERN ELECTRICS & MECHANICS

INCORPORATING
MODERN ELECTRICS and
ELECTRICIAN and MECHANIC

THE ELECTRICAL AND MECHANICAL MAGAZINE
FOR EVERYBODY

Digitized by Google



When You Have Things to Fasten to Brick, Stone or Concrete—

U.S.E

TRADE MARK REG. U.S. PAT. OFF.

The Perfect Fastener

The illustrations on either side of this announcement show ordinary Bolts and Screws fitted into U. S. EXPANSION SHIELDS. The center cuts at top and bottom show U. S. Shields as they are inserted in Walls of Brick, Stone, Concrete or Other Masonry. When the bolt or screw is turned into the Shield a positive inside lateral expansion occurs and the fastening is **there to stay.**

U. S. Expansion Shields are Adjustable!

The Wedge-Nut principle characterizes all U. S. Expansion Shields which permit of the Expansion being increased and fastenings "taken up" or retightened after heavy vibration or excessive strain may have worked them loose. This is not possible with other and NON-ADJUSTABLE types of Expansion Shields.

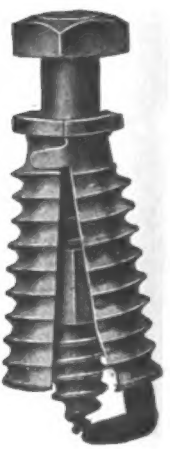
Made in All Sizes—To Meet All Requirements

U. S. EXPANSION SHIELDS are made in a wide range of styles and sizes to meet the varying requirements of all those having fastenings or attachments to make to Brick, Stone, Concrete or Masonry.

Tell Us Your Requirements — We'll Send Samples

U. S. Expansion Bolt Co.

Hudson Terminal Bldg., NEW YORK



Digitized by Google

Like Hearing

the Greatest Speeches Ever Made

without stirring from your chair

The brightest thoughts of the world's most famous orators—the wittiest sayings of the wittiest men of the Nineteenth Century—epoch-making speeches that moved not only audiences but Nations. They are all here just as they were delivered by these distinguished speakers, and gathered in such form as to instruct and entertain you where and when you will.

Modern Eloquence

Consists of Ten Beautiful, Richly Bound Volumes, elaborately indexed, beautifully illustrated with over 80 photogravures on Japanese vellum; paper, press-work and bindings of very highest quality. Having recently purchased the plates of this work, and with them a limited number of sets, we are able to offer you

A Wonderful Bargain

Send us the attached coupon *at once*, and we will tell you how to get the Library on **Easy Monthly Payments**, and with our terms we will also mail you Henry W. Grady's Great Lecture—**"The Race Problem"**—**FREE.** Rep inted from the work itself. Champ Clark says—**"The most famous after-dinner speech within memory of any living man."** Sending the coupon places you under no obligation to buy. If you are interested, tear it off and send it NOW. Don't wait. The offer is limited.

300
After-Dinner Speeches
by Joseph H. Choate, Benjamin Disraeli, James G. Blaine, Wm. M. Evarts, John Hay, Oliver Wendell Holmes, Sir Henry Irving, Chauncey M. Depew, Henry Ward Beecher, Mark Twain, Henry W. Grady, Joseph Jefferson, Robt. G. Ingersoll, Seth Low, Albert J. Beveridge, Woodrow Wilson, etc.

150 Great Addr. sses
by Lyman Abbot, Charles Dudley Warner, William Cullen Bryant, Rufus Choate, Theodore Roosevelt, Arthur J. Balfour, Jonathan P. Dolliver, Edward Eggleston, William E. Gladstone, Charles Francis Adams, John L. Spaulding, Joseph Chamberlain, Grover Cleveland, Fisher Ames, Lawrence Barrett, Henry Drummond, Hamilton Wright Mabie, William Jennings Bryan, etc.

60 Classic and Popular Lectures
by Charles A. Dana, Robt. J. Burdette, Russell H. Conwell, Cannon Farrar, John B. Gough, Andrew Lang, Wendell Phillips, Josh Billings, John Tyndall, Geo. William Curtis, Artemus Ward, Paul DuChaillu, John B. Gordon, Newell Dwight Hillis, John Morley, John Ruskin, Henry M. Stanley, Wu Ting Fang, etc.

2,000 Short Stories and Anecdotes
by Mark Twain, Chauncey M. Depew, Horace Porter, Champ Clark, Joseph H. Choate, John M. Allen, etc.

Are YOU ever asked to respond to a Toast, to Write an Address or Make a Speech?

If so you will find these volumes the greatest help imaginable, because they count in nearly every variety of good pattern for the various classes of oratory. And many an inexperienced banquet chairman, toastmaster or honored guest, casting hopelessly about him for a good story or appropriate remarks, has found here just the inspiration needed.

This Great Work is Sole Occupant of a New Field

It has neither predecessor nor competitor. The most brilliant men of the world endorse it unqualifiedly. To read it is a liberal education—a treasure trove of information accessible in no other form. No intelligent man or woman can fail to be moved by the words gathered here—words which have brought men to tears or laughter, to pity or scorn, to indignation or repentance. Each address is a separate gem and from the standpoint of inspiration alone is priceless.

MAIL THIS COUPON FOR FREE LECTURE

M.E.&M.

GEO. L. SHUMAN & CO.
Dept. 50, Ohio Building, Chicago

Please send me free lecture and full description of Modern Eloquence with special prices and terms.

Name.....

Address.....

Digitized by Google

MODERN ELECTRICS AND MECHANICS

ORLAND J. RIDENOUR, President. W. G. RIDENOUR, Secretary. AUSTIN C. LESCARBOURA, Editor.

Volume 28. **March, 1914** **No. 3**

Contents

COVER ILLUSTRATION: *Experimenting with a Divining Rod.*

ELECTRICITY Page

Construction of Small Alternating Current Motors 309
A D'Arsonval Galvanometer 317
Electrical Equipment of the Panama Canal 300
High Frequency Current Apparatus 329
New Resistance and Heating Units 295

MECHANICS

An Auto-Sled for the Young Folks 297
An Attractive Inkstand 304
A 400 H.P. French Air Ship 297
Simple Home-Craft Furniture 333

RADIO COMMUNICATION

Construction of a Quenched Gap 296
The Edison Effect in Wireless Telegraphy 283
Institute of Radio Engineers 332
A New Arc Generator for High Frequency Current 294
The New London Radio Station 298
Recent Work of the Radio Service 282

GENERAL

The Divining Rod Problem and Its Solution 279
Flying Sparks 338
Modern Industrial and Military Explosives 289
The Panama-Pacific Exposition and the Kahn Act 307

DEPARTMENTS

Apparatus Exchange 396
Book Reviews 350
The Editor's Desk 336
Experimental Department 317
New Things 356
Practical Hints 324
Questions and Answers 380
Recent Novel Patents 352-354
Wireless Telegraph Contest 372

Advertisers' Index 276

Digitized by Google

Be an Electrical Engineer!

Earn $150.00 to $250.00 a Month

WRITE TODAY! NO EXPERIENCE NECESSARY to enter this wonderfully fascinating, high salaried work. You should earn BIG MONEY IMMEDIATELY—on completing our Electrical Courses.

The great engineering companies of the country are ALWAYS searching for PRACTICAL, TRAINED ELECTRICAL ENGINEERS. Excellent positions open all the time. We teach you to be an expert electrical engineer in a short time AT SMALL EXPENSE.

Electricity Offers Great Opportunities

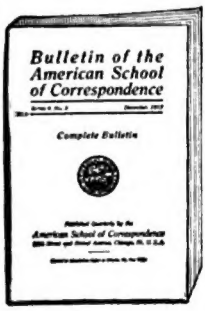
There is no limit to the field of Electricity—you men who take up this work now will discover uses for this great force now unheard of.

Besides the high salaries paid to electrical engineers—the big money you can make by starting an electrical business of your own—great fortunes are to be made through electrical inventions in the future.

The American School will train you to be an electrical worker or an expert—the courses are complete and practical. You can start right in now and prepare yourself for a better position and more pay.

You Can Earn While Learning

No need to give up your present occupation. Just devote your spare time during the day or evening to this interesting work. It is no task to learn Electricity. As you read through the pages of our courses, you will find yourself simply "wrapped up" in the work. And you can draw your present salary while you learn—by means of this home study course.



The only expense will be the nominal charge for our complete tuition.

Pay as You Wish! Don't hold back because of the money. We will arrange for you to pay as best suits your needs.

GUARANTEE:

The world-wide reputation of the American School of Correspondence for integrity and efficiency, together with its thousands of successful graduates, gives you an unqualified guarantee of Success.

This Book contains Valuable Information—it's Free

Our School Bulletin gives complete information concerning our courses and explains how YOU can become an expert Electrical Engineer.

Mail this Free "Success" Coupon

—**No obligations, so mail at once.** Your name and address on this coupon brings to you our School bulletin (catalogue) and complete information. Decide now to take this great step toward Success. Don't be a drudge all your life. Be one of the men "higher up"—the man who is paid for what he KNOWS, not for the hard work he actually does. No obligations in sending the coupon—so mail today—immediately.

American School of Correspondence
CHICAGO, U. S. A.

FREE SUCCESS COUPON

American School of Correspondence
Chicago U. S. A

Without any obligations on me whatsoever please send me your bulletin and complete information regarding course checked below.

...Electrical Engineer	...Electrical Wireman
...Telephone Expert	...Elec. Light & Power Supt.
...Hydro-Electric Engin'r	...Hydro-Mechanical Engin'r

M.E.&M. 3-14

NAME .....

ADDRESS .....

Digitized by Google

MODERN ELECTRICS and MECHANICS

ADVERTISERS' INDEX

	Page
Adams-Morgan Co.	377
All Makes Typewriter Exchange.	357
American Collection Service.	408
American School of Correspondence	375-416
American School of Music.	342
American Technical Society.	337
Armstrong Mfg. Co.	349
Arnold, J. F.	377
Author's Motion Picture School.	339
Averill, F. E.	362
Barrett's School of Telegraphy.	375
Baseball Magazine.	415
Big Mail Directory.	344
Boston School of Telegraphy.	374
Brad-Dar Electric Co.	364
Bradley Polytechnical Institute.	345
Brandes, C., Inc.	379
Branch School of Engineering, The Jos. G.	412
Brinkler, G. H.	343
Bronx Girls Club.	390
Brooklyn Telegraph School.	374
Bunnell & Co., J. H., Inc.	378
Carleton Co., The.	367
Chambers & Co., F. B.	382
Chandlee & Chandlee.	355
Chicago Ferrotype Co.	343
Chicago Stock Gear Works.	346
Clapp-Eastham Co.	383
Clark Blade & Razor Co.	359
Coleman, Watson E.	355
Colonial Works.	344
Columbian Correspondence College	342
Cosmopolitan Hotel.	406
Cosmos Electric Co. 344-346-370-378	
Crescent Machine Co., The.	346
Crowther, G. S.	378
Cushing, Jr., H. C.	413
Cyclecar and Morotette.	404
Dart Model Co.	362
Dashiell, B. Francis.	377
Diamond Jewelry Co.	345
Diamond Transformer Co.	364
Dodge's Telegraph, Railway & Wire. Inst.	374
Dorn, J. C.	362-375
Dubilier Electric Co., Inc.	384
Duck Co., The J. J.	384-385
Duffie & Co., John S.	358
Dyke's School of Motoring.	345
Earlington Hotel.	406
Edelman, Philip E.	388
Edgcomb-Pyle Wireless Mfg. Co.	381
Edwards Mfg. Co., The.	362
Electrical Engineering.	404
Electrical Journal, The.	404
Electroforce Pub. Co.	402
Engineering Education Extension	342
Evans & Co., Victor J.	358
Evans Piano Co.	413
Fort Wayne Corres. School.	363
Frint & Co.	345
Fuller & McLachlen.	357
Funk & Wagnalls Co.	360
Gardam & Son, Inc., Wm.	346
Gas Energy Co.	390
Goettman, O. J.	364
Golden Rule Cutlery Co.	346
Grant Electric Co., The.	389
Grebe & Co., A. H.	370
Haller-Cunningham Elec. Co.	378
Hammond Typewriter Co.	419
Harrison Walton.	358
Herald Square Hotel.	406
Holtzer-Cabot Elec. Co., The.	380
Imperial Elec & Mfg. Co.	386
International Correspondence Schools	377-347
International Textbook Co..	369-381
Interstate Elec. Nov. Co.	366
Jancke Laboratory, D. F.	386
Joice, J. H.	345
Johnson & Son, S. C.	378
Keith, M. L.	403
Kendrick & Davis Co.	366
Killoch Co., David.	375
Knapp Elec. & Nov. Co.	365
Lacey, R. S. & A. B.	358
La Salle Light Co.	376
League Collar Co.	346
Lelman Bros.	367
Lenox Novelty Co.	362
Lester Co., Francis E.	345
Levy Electric Co.	365
Lindell Electric Shop, The.	382
Mack Company.	349
Manhattan Elec. Sup. Co.	111
Marconi Wireless Telegraph School of Instruction.	375
Marr, Arthur Phelps.	357
McCreary-Moore Co.	377
Mead Cycle Co.	345
Miatt, G. W.	335
Mohr Bros.	367
Montgomery & Co.	349
Mueller, M.	377
Muller & Jablonsky.	355
Munn & Company.	353
Murdock Co., Wm. J.	373
National Salesmen's Training Association	342
Newark Elec. Sup. Co.	349
New York Electrical School, The	341
New York School of Engraving.	345
Nichols Electric Co.	389
North American University.	343
North Bros. Mfg. Co.	348
Northwestern Motor Institute.	345
Omnigraph Mfg. Co.	374
Overland Monthly Co.	415
Owen, Richard B.	353
Packard Electric Co.	383
Paine Uptown Business School, The	375
Parker, C. L.	353
Patent Exchange, The.	355
Philadelphia School of Wireless Telegraphy	376
Postal Life Insurance Co.	IV
Powhatan Hotel.	406
Practical Auto School.	345
Pursell, John V.	378
Quinn Conservatory of Music, Marcus Lucius.	342
Radio Apparatus Co., The.	386
Radio Tel. & Tel. Co., The.	382
Randolph & Co., L. F.	351
Rasmus, Gustav, M. E.	357
Roach, W. N., Jr.	357
St. Andrews Bay Nursery & Orchard Co.	406
Sanche Co., Dr. H.	371
Sanders, H. J.	353
Saunders & Co., Geo. H.	377
School of Engineering of Milwaukee	409
Seitz, M. O.	376
Shaw Co., J. Elliott.	390
Shelmo-Jacobsen, R.	355
Shuman & Co., George L.	378
Sievers, E. G.	353
Smith & Hemenway Co.	348
Spiegel, May, Stern Co.	346
Spon & Chamberlain.	364
Starrett Co., The L. S.	349
Sweet & Co., L. W.	365
Swift & Co., D.	353
System	403
Technical World.	409
Thacher Magnetic Shield Co.	385
Thordarson Elec. Mfg. Co.	388
Thorpe, Samuel S.	406
Thomson, H. C.	356
T-Square & Triang'e Co., The.	345
U. S. Expansion Bolt Co.	II
Vacuum Supply Co.	362
Victor Typewriter Co.	411
Vigneau Mfg. Co.	342
Viking Electric Co., Inc.	380
Voltamp Elec. Mfg. Co.	367
Wading River Mfg. Co.	362
Western Oxygenator Co.	344
Wide World Magazine, The.	414
Wightman & Co., Luther H.	349
Wilson, A. M.	357
Winger Elec. & Mfg Co.	379
Wireless Mfg. Co., The.	378
Wireless World, The.	407
Woodward, H. L.	353
Y. M. C. A. Telegraph School.	375

Expiration We enclose a renewal blank with the last copy sent out on each subscription. To avoid missing valuable numbers, renewals should be made at once.

Change of Address When you change your address notify us promptly, giving old as well as new address. Also notify your former postmaster, as it often happens that our mailing list is made up when your notification reaches us. In such cases the magazine will go to your old address, but the postmaster will forward copy to your new address upon request. No copies sent after expiration of subscription.

Magazine issued monthly. Yearly subscription in U. S., $1.50. Manhattan and Canada, $1.65. Foreign, $2.00 in Gold. SINGLE COPY, 15 cents.

MODERN ELECTRICS AND MECHANICS may be had at all news stands in the United States and Canada; also at Brentano's, 37 Avenue de l'Opera, Paris.

Original contributions of timely interest pertaining to the electrical and mechanical arts, or on any branch of popular science and invention, especially with practical working directions, drawings or photographs are solicited. No manuscript returned unless postage is enclosed.

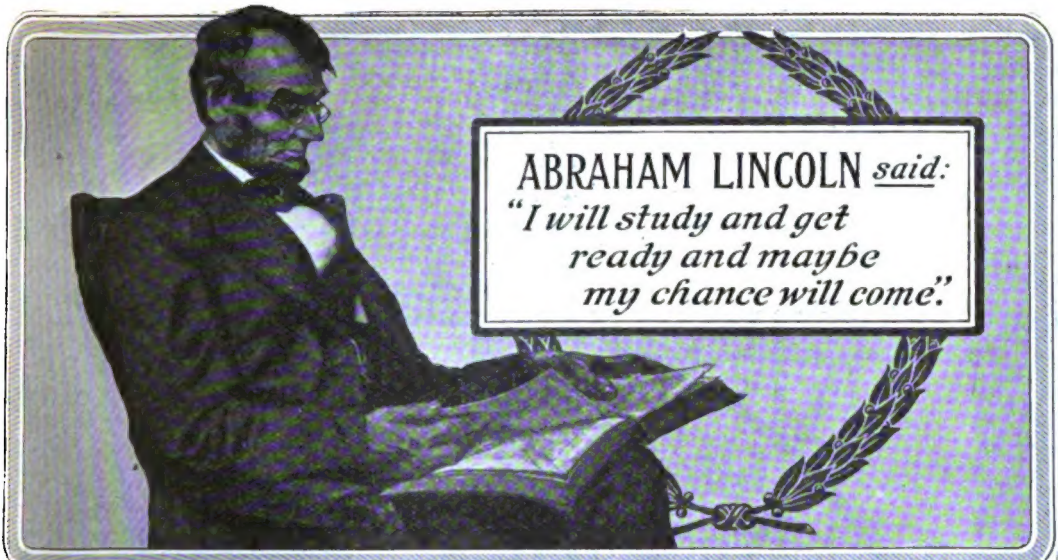
Forms close the 1st of the month preceding date of publication. Advertising rates on application. Entered as second class matter March 31, 1908, at the New York Post Office, under the Act of Congress of March 3, 1879.

MODERN ELECTRICS AND MECHANICS should be on the news stands on the 15th of the month preceding the date of issue. Readers unable to get the magazine on the 17th will confer a favor by notifying the Publishers. News stand patrons should instruct their Newsdealer to reserve their copy of MODERN ELECTRICS AND MECHANICS, otherwise they are likely to find the magazine "sold out."

The contents of this Magazine are copyrighted and must not be reprinted without permission.

Published by Modern Publishing Co., 231 Fulton St., New York, U. S. A.

Digitized by Google



YOUR Chance Will Come

Born in a one-room log cabin on the Kentucky frontier, Abraham Lincoln had very little chance to acquire an education. But he was determined to succeed. "Some day," he said, "my chance *will* come." So he studied and got ready. And his chance *DID* come.

Your chance will come. Some day you'll be considered for promotion or for a good job in some other line of work. If you are ready, you'll go up—there will be no limit to your chances to advance—if you are ready to meet them.

And you *CAN* get ready. No matter if your schooling was limited—if you do have to work long hours. If you really want a better job, the International Correspondence Schools can train you for it right in your own home during your spare time.

Every month more than 400 I.C.S. Students voluntarily report promotions or salary increases that have come as a direct result of the help of the I.C.S. What the I.C.S. have done for these men they can do for *YOU* right in your own home during your spare time.

Just mark on the attached coupon the position or occupation you most like and mail the coupon to the I.C.S. This won't obligate you in the least—but it will bring you the facts about this exceptional opportunity that may change the course of your entire life.

Mark the coupon NOW

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 992-T, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for the position before which I have marked X.

Electrical Engineering	Mechanical Engineer
Electric Lighting	Mechanical Draftsman
Electric Railways	Shop Foreman
Electrician	Concrete Construction
Electric Car Running	Architect
Dynamo Foreman	Contracting & Building
Wireman	Architectural Draftsman
Mining Engineer	General Illustrating
Telephone Expert	Chemist
Surveyor	Bookkeeper
Automobile Running	Advertising Man
Agriculture	Civil Service Exams.
Poultry Raising	Salesmanship

Name _____

St. and No. _____

City _____ *State* _____

Present Occupation _____

Digitized by Google

Johnson's
Wood Dye
In 17 shades—for the artistic coloring of wood —soft and hard.
Johnson's
Prepared Wax
A complete finish and polish for all wood—floors, woodwork and furniture.
Use This Coupon
for Free trial packages and Instruction Book, "The Proper Treatment for Floors, Woodwork and Furniture."
S. C. Johnson & Son
"The Wood Finishing Authorities"
Racine, Wis.
PRESENT THIS COUPON TO YOUR DEALER IN PAINTS
45c—Value FREE—45c
To Paint, Hardware or Drug Dealer: Furnish the bearer, free of all expense, with
1—25c Instruction Book
1—10c Bottle Johnson's Wood Dye
1—10c Can Johnson's Prepared Wax
S. C. Johnson & Son, Racine, Wis.
(Must be presented by an adult.)
MB&MS
JOHNSON'S WOOD DYE
S. C. JOHNSON & SON

Digitized by Google

Modern Electrics and Mechanics

VOL. XXVIII. March, 1914. No. 3

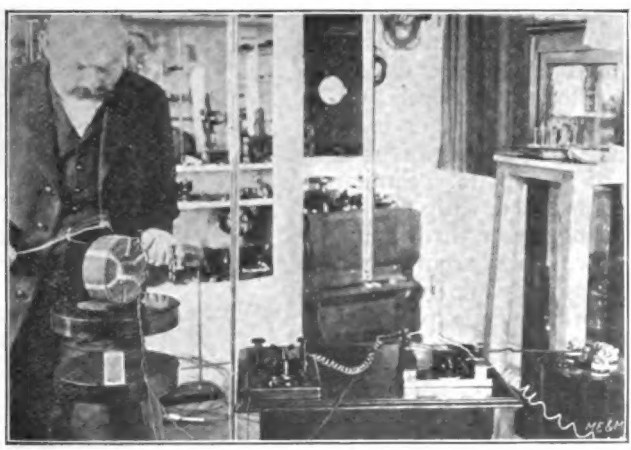
The Divining Rod Problem and Its Solution

The Recent Experiments Conducted in Europe Have Largely Contributed Towards Its Solution

By Dr. Alfred Gradenwitz

THE representatives of official science have long been inclined to exhibit in regard to any phenomena disagreeing with their own system, the same intolerance as was shown by the opponents of scientific investigation in centuries gone by; anything not immediately accountable by purely physico-chemical effects being only too often discarded as unreal.

There has, however, been of late a tendency to be more cautious in this connection, recent scientific work going to show that the realm of phenomena directly or indirectly accessible to our senses far exceed the present scope of physics and chemistry, and in place of the negative standpoint of former times, unprejudiced interest in all classes of phenomena is becoming more prevalent.



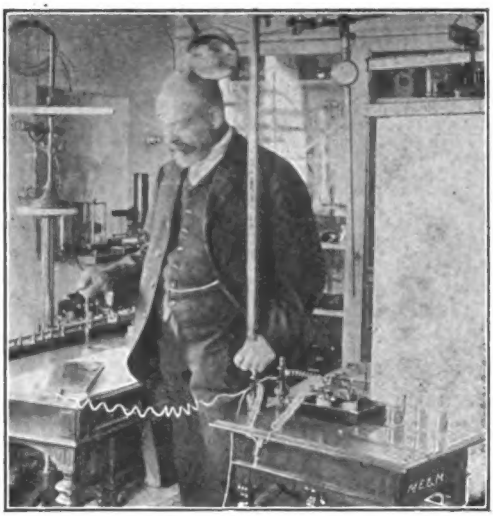
TESTING THE MAGNETIC CHARACTERISTICS OF A DIVINING ROD BY MEANS OF A COIL OF WIRE

A striking instance of the above is afforded by the divining rod problem: After being, until a few years ago, the object of universal derision, the mysterious rod of water seekers claims more and more the attention of scientific men, and the congress recently held at Halle, as well as the public demonstrations made a short time ago in France, are sufficient evidence of the importance now attached to the problem from a scientific and practical point of view.

For the same reason, the experiments recently made by a Swiss engineer, Mr. E. K. Müller, of Zurich, would seem to deserve of more than passing interest. While not yet solving completely the problem, they unmistakably point to the direction where its solution is to be

Digitized by Google

sought and bear out the hypothesis so often suggested that magnetic and electrical effects are mainly concerned; effects, it is true, which only those gifted with a peculiar susceptibility are able to respond to.



EXPERIMENTING WITH A BRASS PENDULUM AND CHARGED COPPER PLATE

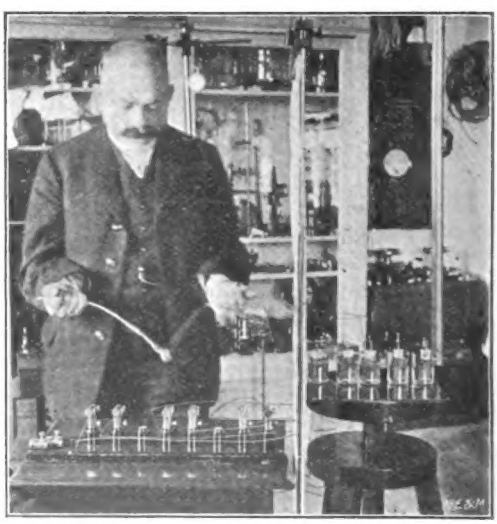
Mr. Jäggi-Perrard, architect of the Bernese Building Department, placed himself at the experimenter's disposal, and, in the first place, made the following experiment: A brass pendulum suspended by a string and held over a copper plate connected to a Daniell cell, was found either to be set vibrating or to be arrested, according to the negative or positive charge of the plate. Similar phenomena were observed with the divining rod, this being either thrown upwards or drawn downwards, according to the charge of the copper plate.

Jäggi then performed an experiment on two 5-franc pieces, which—singly or placed above one another—would repel his whalebone divining rod and set a pendulum (or watch and chain) vibrating. When the two silver coins were kept asunder by means of two matches, thus forming an electric condenser, the rod and pendulum failed to work, though a thin thread laid on top of the coins would counteract the condenser effect, restoring the above phenomena.

The following experiments on surface and edge effects were likewise interesting: Jäggi offered to ascertain by means of the divining rod from another room the height of a paper sheet invisible to himself. After bending one corner of a big paper sheet, he ordered a third person to keep it in the adjoining room at various levels above the floor, and was able to ascertain these levels to approximately an inch. As long as the rod was above the paper sheet, it would in fact be turned upwards, whereas below the paper, a downward deflection occurred. Jäggi, by the way, shows a similar sensitiveness in regard to flowers of various colors: When focussing his attention on a given color, he was able from the adjoining room to ascertain the level of the flowers of the same color to within half an inch of the correct height.

Another experiment consisted of determining by means of the divining rod or pendulum the position of magnet poles. When experimenting on a soft iron bar in place of a magnet, he, very much to his surprise, noted no pole effects at the ends and only reported a deflection of the divining rod in the middle of the bar —where he least expected it.

In order to further test Jäggi's sensitiveness to opposite electric charges, the experimenter placed before him a set of small glasses constituting a galvanic



DETERMINING THE PRESENCE OF BATTERY CURRENT IN COPPER CONDUCTORS

battery. Though Jäggi did not know that the glasses belonged to a battery, the divining rod, on passing over them, would move up and down alternately. Another experiment was made by arranging the cell terminals out of view

Digitized by Google

of the battery itself and connecting them with the zinc and copper poles more or less at random, so that no regular alternations of positive and negative terminals were obtained. The divining rod nevertheless operated in exactly the same manner as before.

Jäggi then undertook to ascertain at which point of a paper sheet a silver coin had been placed in his absence: He even offered to find out any curve described in moving the coin over the paper. This experiment likewise was a perfect success, Jäggi determining with his divining rod both the original position of the silver coin and the curve in which it had moved over the paper sheet. This striking phenomenon is accounted for by the friction exerted in moving the coin and the electric charges thus produced on its way.

DETERMINING THE EXACT SPOT PREVIOUSLY OCCUPIED BY A SILVER COIN

In order finally to ascertain whether the subject responded to any kind of magnetic effects, regardless of the presence or otherwise of iron and steel, Müller used a coil of copper wire, generating in its neighborhood a magnetic field. Pulsating direct current of 5 amperes being applied to this coil, the divining rod held in front of the left-hand end of the coil was thrown down violently, this effect, at 160 centimeters distance showing no apparent reduction in intensity. Peculiar phenomena were also noted on closing and opening the current: As soon as the current was completed, the divining rod would be thrown downward most violently, this motion being counteracted quite as promptly on breaking the current—without Jäggi's knowing it. Similar, though more complicated phenomena were noted at the opposite end of the coil, and after inserting an iron core, the same effects were found to take place with increased intensity.

The above experiments strikingly show the nervous system in certain conditions of excitement—or that of especially susceptible persons—to be much more sensitive and to possess far greater faculties than had hitherto been assumed.

Moreover, the way chosen by Müller is bound to lead to the definite solution of the divining rod problem.

WIRELESS OPERATORS

We are informed by Mr. W. D. Terrell, Radio Inspector, Custom House, New York City, that he receives many requests for wireless operators, and for this reason he is desirous of securing a list of men who are in a position to operate a radio station—men who are not employed as wireless operators at present.

Applicants should either hold a first or second grade commercial license, or be capable of passing the examinations to secure either of these licenses. In their application, all particulars should be stated regarding past experience, whether the operator possesses a first or second grade license or can pass a test for either of these licenses, as well as the minimum salary that will be considered. All correspondence should be addressed to the radio inspector at the above mentioned address.

There are somewhat more than 500 recognized tree species in the United States, of which about 100 are commercially important for timber. Of the 500 recognized species, 300 are represented in the government's newly acquired Appalachian forests. All American species, except a very few subtropical ones on the Florida Keys and in extreme southern Texas, are to be found in one or another of the national forests.

A friend in need is a good friend indeed—but we usually avoid him then.

Google

Recent Work of the Radio Service.

THE Radio Service of the Department of Commerce and Labor, the duties of which are to inspect radio stations and enforce the laws of the United States pertaining to radio communication, has been doing some very excellent work since its existence of barely one year.

One of the duties of the radio inspectors at the port of New York is to inspect the various vessels equipped with radio apparatus and pass upon the wireless apparatus which is found to be in good working order and in accordance with the regulations. Although in practically every instance the main wireless apparatus of vessels is found to be in excellent working order, it often happens that the auxiliary set has been used for many years and is very inefficient. However, these sets are usually able to pass the Government regulations and are therefore not replaced by up-to-date instruments.

A recent example of the vigilance exercised by radio inspectors in passing upon wireless sets is presented by the examination of the steamer *Cedric* of the White Star Line. The radio station of this steamer was examined on January 29th and fault found with the auxiliary transmitting set. A lead of this set was discovered to be disconnected and after that matter was adjusted, further trouble developed from leakage of current over the surface of the roof insulator. The apparatus failed entirely to transmit. Although the radio inspector went on board the *Cedric* at 11:45 and the vessel was due to sail at 12 o'clock noon, he informed the captain that the ship could not sail with the auxiliary set in this condition. The radio inspector offered to stay on board the vessel and be taken off by a tug when the vessel was off Staten Island. The vessel then left her dock. After a new roof insulator had arrived and was installed, the set again failed to operate. It was then thought by the radio inspector that probably the entire aerial would have to be taken down and be re-insulated. An officer was sent ashore with instructions to get repair men and new insulators from the Marconi Company. After continuous adjustment the operator finally succeeded in obtaining a spark from the auxiliary set at 1.30 P. M. and the radio inspector found that messages could be sent and that a radiation of 1.3 amperes was obtained in the antennæ. At 2.30 P. M. the tug came back to the vessel with the Marconi inspector bringing a full set of antennæ insulators which were left on board.

By this time, a heavy fog came up over the bay and held the vessel 24 hours before it could sail. This delay would have been avoided had the auxiliary set been in good working order.

Aside from the rigid inspection of radio apparatus, there is a law stating that two operators should be carried on all steamers. This law was a very wise and necessary one, since under the old arrangement the single wireless operator was on duty during the day-time and retired at night. This meant that calls of distress at night time—when most accidents occur—were not likely to be heard. Under the present regulations, two operators are carried, so that one or the other is on duty during every hour of the twenty-four.

The effectiveness of this requirement is shown in the recent *Volturno* disaster which occurred at night. When the signals of distress were sent out from the *Volturno,* all of the vessels within the range heard these signals and responded. Under the old arrangement of carrying single operators, the chances are that, probably none of the vessels would have heard the calls of distress, since all of the operators would have been asleep at that time.

Much praise is due Mr. Marriott, one of the radio inspectors at the port of New York, for the rigid inspection of radio apparatus on board steamers entering this port. The Washington authorities and the radio service as a whole are certainly entitled to great appreciation for what they have accomplished during the short time the radio service has been in effect.

More than 120,000,000 board feet of timber was given away free by the government last year to settlers and miners living in or near the national forests.

Google

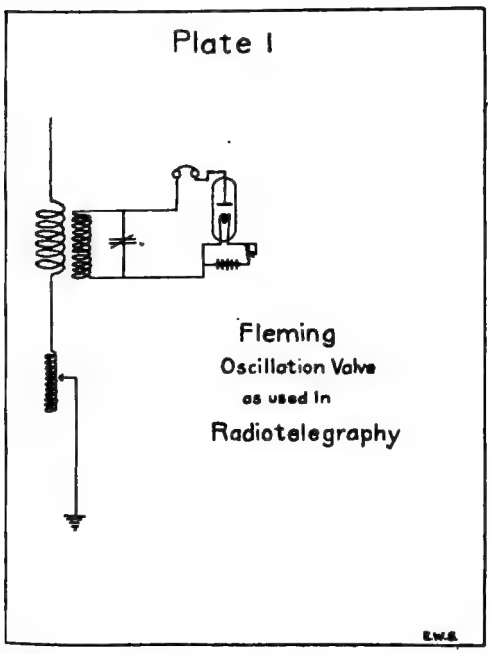
The Edison Effect in Wireless Telegraphy

Describing a Series of Experiments in Connection With the Adoption of this Phenomenon to the Reception of Signals

By Ellery W. Stone

Illustrations from drawings made by the author.

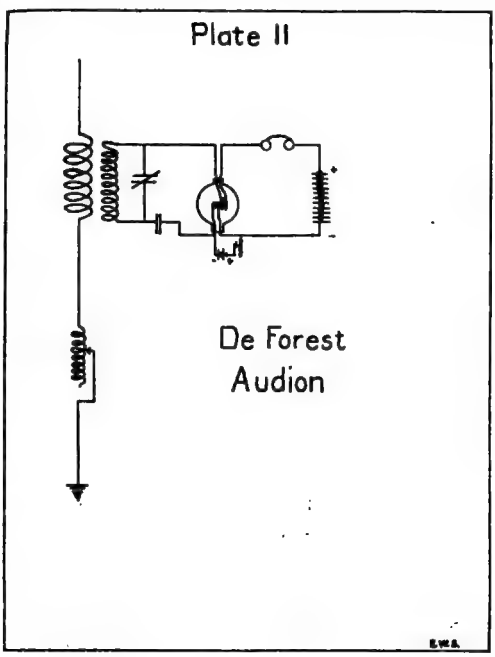
WHEN a lamp filament is heated to incandescence, as in the ordinary electric lamp, the filament radiates electrons. A proof of this is as follows: Take a common carbon filament lamp,



unseal it, and interpose within it a metal plate 1 cm. square. Reseal and exhaust the lamp. Connect this plate or isolated electrode to one side of a galvanometer, and connect the other side of the galvanometer to the negative wire of the d. c. mains supplying the current for the filament.

When current is sent through the filament, no effect on the galvanometer is noted. If, however, the galvanometer is changed from the negative to the positive terminal of the lamp filament, a large deflection of the galvanometer is observed. This indicates a difference in potential between the positive terminal of the lamp, and the sealed-in electrode. Since there is a difference in potential, the electrode must have received a charge opposite in sign to that of the positive terminal of the filament, and hence a negative charge. This is, of course, adequate proof that electrons or negative ions are given off from the filament when heated to a stage of incandescence.

The flow of negative ions across the vacuous space between the filament and the electrode corresponds to the flow of ions across an electrolyte, from cathode to anode, and just as these moving ions constitute the means of conduction of the electric current in an electrolyte, so



may the radiation of electrons in a gas be similarly utilized.

From the fact that negative ions are given off from the filament to the sealed-in electrode, it is obvious that a rectifying characteristic must be one of the ac-

Google

companiments of this phenomenon. A flow of negative ions from the filament to the plate is equivalent to a flow of positive ions from the plate to the filament. Hence, it is seen that we can

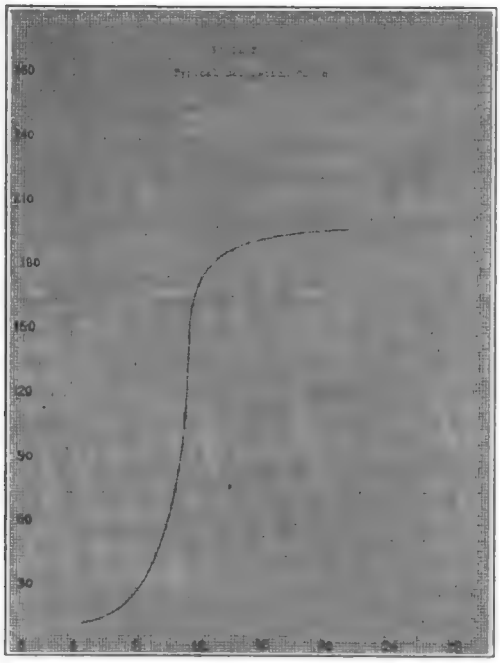


PLATE 3.—TYPICAL SATURATION CURVE

pass a much greater current from the plate to the filament, *with* the current of positive ions, than from the filament to the plate, *against* the flow of positive ions.

It is this property of the unilateral conductivity of such a lamp as previously described that has caused the adoption of the Edison effect to the needs of radio-telegraphy.

THE OSCILLATION VALVE.

The oscillation valve was invented by J. A. Fleming, of England, in 1904. Fleming discovered, as a very natural sequence to his investigation of the Edison effect, that the property of the unilateral conductivity of a stream of cathode rays could be utilized in the construction of a small rectifier of alternating currents of any frequency.

Fleming's valve consisted of a lamp with a carbon filament (metal ones were introduced later), and a sealed-in electrode of the type described in the first paragraph.

An interesting feature with regard to the pressure necessary for the best results may be mentioned. Lamp makers are familiar with the fact that when a current is passed through a filament as the lamp is being exhausted, a certain point of exhaustion will be reached where a blue light manifests itself between the two platinum terminals to which the filament is fastened. This is simply the establishment of a shunt circuit to the filament, the flow of ions caused by the Edison effect acting as the conducting medium. On decreasing the pressure, the light becomes more intense, indicating a greater Edison effect, then dies out, and as a high stage of exhaustion is approached finally dies out entirely. Hence, we see that at very low pressure, the Edison effect in a lamp is nil. This is because that at such a low pressure, there are not enough molecules of air present to be broken up into negative ions by collision with the electrons liberated by the incandescent filament.

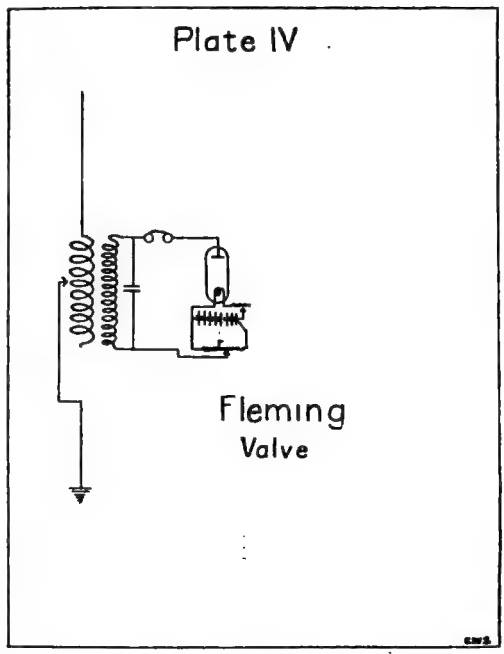


PLATE 4.—WIRING DIAGRAM FOR THE FLEMING VALVE

The fact that only a fairly low pressure is most suitable for a maximum Edison effect leads at once to a difficulty. Any lamp filament will suffer more or less disintegration from combustion

Digitized by Google

when heated to incandescence in anything but a very low pressure. Since a very low pressure is detrimental to a maximum Edison effect, as we have just seen, the manufacturer of an oscillation valve is accordingly forced to choose between sensitiveness and long life—usually it is the sensitiveness—hence the purchaser's pocketbook that suffers.

Returning to the Fleming oscillation valve. Plate 1 shows the method used in connecting this valve in the receiving set of a radio-telegraphic station, when using the valve as a rectifier.

The principle is this: If we superimpose electric oscillations on the valve, i. e., connect the source of oscillations to the filament and electrode, the rectifying properties of the valve will produce a pulsating direct current by destroying or greatly weakening one-half of every cycle. (In radio-telegraphy the "source of oscillations" is usually the secondary terminals of a high frequency transformer whose primary is connected to the earth and an antenna.) This pulsating direct current may be used to actuate a galvanometer, which would be insensible to alternating currents, or an integral effect may be obtained by utilizing the pulsating direct current from the valve to charge a small condenser which will discharge the total energy of the successive charges due to each train of incoming waves into a telephone receiver. One click or response of the receiver is heard for each train of oscillations. Thus, the frequency of the note heard in the telephone receiver is the train frequency of the waves, and this frequency is the frequency, in most cases, of the current used in the primary of the step-up transformer at the transmitting station.

As is well known, this rectifying principle is utilized in almost all the various devices used as detectors of the electro-magnetic waves in radio-telegraphy.

Dr. Lee de Forest, of the United States, has modified the Fleming valve in an instrument known as the De Forest audion. Its plan of connection in a radio-telegraphic receiving set, which is shown in Plate 2, is seen to be somewhat different from that of the Fleming valve.

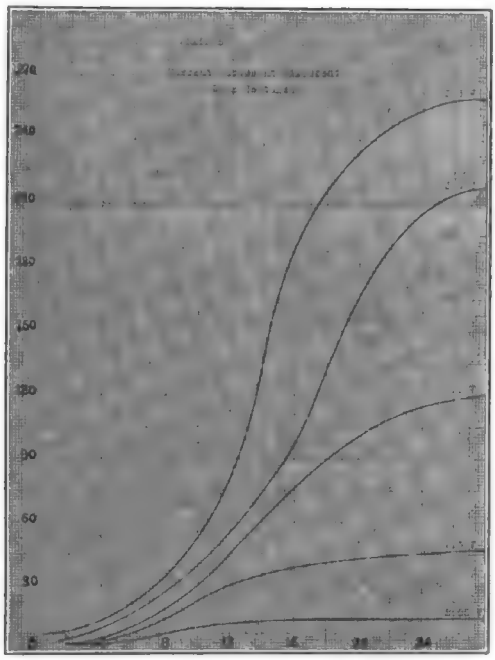


PLATE 5.—CURRENT CURVES AT DIFFERENT LAMP VOLTAGES

It has been already shown that the oscillation valve, having the properties of a rectifier, may be used as a detector of radio-telegraphic signals. On the other hand, we may employ it in another manner, depending on the fact that such ionized gas does not obey Ohm's law as a conductor.

It has long been known that the conductivity of rarefied gases differs from that of metal or liquid conductors. Suppose we have two electrodes in a rarefied gas, the negative electrode heated to incandescence. If we apply a low voltage to these electrodes and steadily increase it, we will find, on plotting observed data, that the current curve is not

Google

linear, as would be the case if the conductivity obeyed Ohm's law, but, on the contrary, starts out slowly, then rises rapidly, then runs off on a flat curve. Such a curve is called a saturation curve, and the current represented by the upper or flat part of the curve is called the saturation current.

Plate 3 represents such a curve. The exact shape of the curve is, of course,

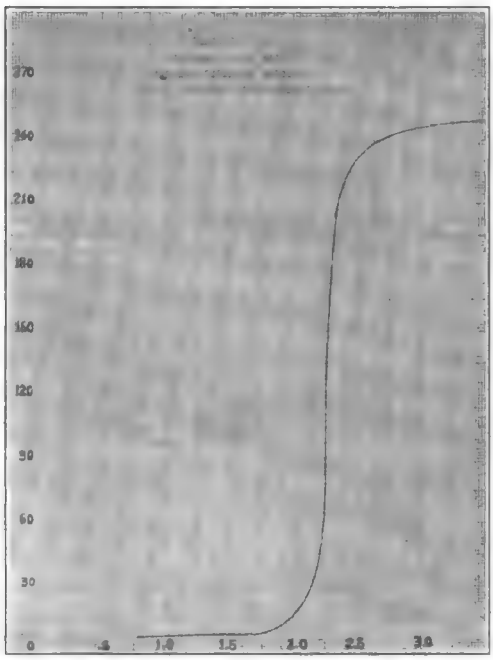


PLATE 6.—CURRENT CURVE WITH VARYING FILAMENT VOLTAGES, E.M.F. BETWEEN ELECTRODES 27 VOLTS

dependent on the conditions under which the data is taken.

The resistance of the gas accordingly may vary from a very high value to a fairly low one, depending on the temperature at which the negative electrode is maintained, and the voltage impressed between the two electrodes. It has been found that if the positive electrode is allowed to become heated by conduction and radiation from the negative one, the valve loses its property of efficient rectification, its rectification falling to 80 per cent. when 3 watts per candle is used in heating the filament—the negative electrode.

Examining Plate 3, we see that if the impressed voltage on the electrodes is maintained at such a value as to keep the current at a magnitude represented by that part of the curve just below the steep part, a very slight increase in the voltage would cause the current to rise almost instantly to the top of the steep portion of the curve. Hence, it can be seen that if we increase and diminish the voltage by small amounts, as by the application or superimposition of a small alternating voltage on the steady voltage, then the resultant current would be a considerable distance up the steep portion of the curve.

For radio-telegraphic use, then, we can impress this critical constant voltage in series with the valve and the radio receivers, and by introducing, by means of a small oscillation transformer, the high frequency alternating voltage of the received oscillations on the circuit, we would get a sound in the receivers representing the rise of the current up the curve.

Plate 4 shows the Fleming valve used as a detector when making use of

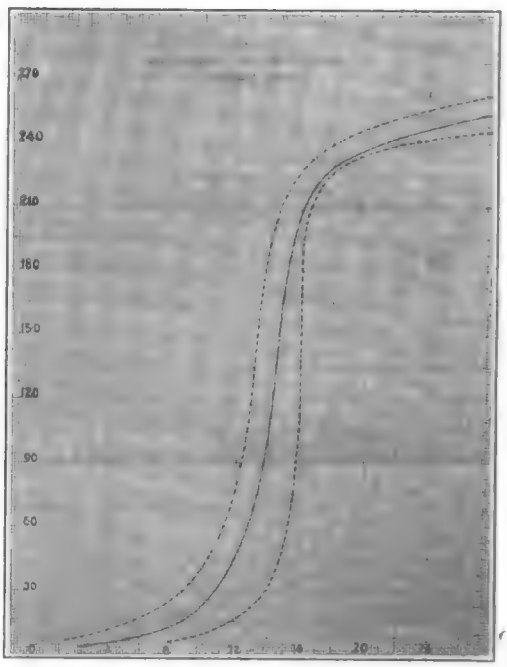


PLATE 7.—INFLUENCE OF MAGNETIC FIELD ON CURRENT CURVE
TOP CURVE—NO. 1, NEXT CURVE—NO. 2, AND BOTTOM CURVE—NO. 3

the fact that the current-voltage curve of the valve is non-linear. The high resistance, r, serves to vary the impressed steady voltage so as to bring the current to that part of the curve at which

Digitized by Google

a sudden change of curvature takes place. By referring to Plate 2, it will be seen that Dr. de Forest makes use of this property of the oscillation valve rather than of its property of rectification. In actual practice, it is quite customary to bring the current to the critical point on the curve by varying the voltage to the lamp filament, which, as can be seen, would have the same effect.

OBSERVED CURVES.

The writer set up such a circuit as shown in Plate 2 in the D. C. laboratory of the Mechanics Department of the University of California. It was not possible to read the current on any instrument calibrated in amperes or fractions of an ampere, so a galvanometer was used. In all the curves shown, the ordinates will be scale deflections of the D'Arsonval galvanometer in centimeters, which will be sufficient for showing the shape of the different curves.

Plate 5 shows several curves as observed, in which the abscissae are the voltages applied across the two electrodes.

Plate 6 is different from the curves of Plate 5 because in the latter, in each curve the lamp filament voltage was kept constant as the impressed voltage was varied. In Plate 6, the impressed voltage was kept constant at 27 volts, and the lamp voltage varied throughout. This illustrates the statement made previously that the filament voltage may be varied, keeping the applied voltage constant, to bring the current across the gas to the critical point on the curve.

It has been known for some time by radio operators using the audion, which is the only oscillation valve in common use in this country, that if a magnet were brought up to the valve, certain positions could be found where the sensitiveness could be increased to a surprising degree, while other positions of the magnet would have the reverse effect. The writer plotted some curves with the valve under the influence of a magnetic field, and these results are shown in Plate 7.

Let us proceed to an analysis of these curves from a physical, not a mathematical, standpoint. The middle curve, Curve No. 2, is the usual saturation curve with no magnetic field on the valve. Curve No. 6 shows the curve distorted by the magnet in one position, and Curve No. 3 shows the curve with the magnet in another position. It will be seen that Curve No. 1 is of practically the same shape as Curve No. 2, hence, since the sensitiveness of the valve depends on the steepness of the current curve, as previously explained, no gain has been realized by subjecting the valve to the influence of a magnetic field. The fact that the curve is displaced to the left of the middle curve throughout, simply means that it takes less applied E.M.F. to produce a given current across the wing and the grid,

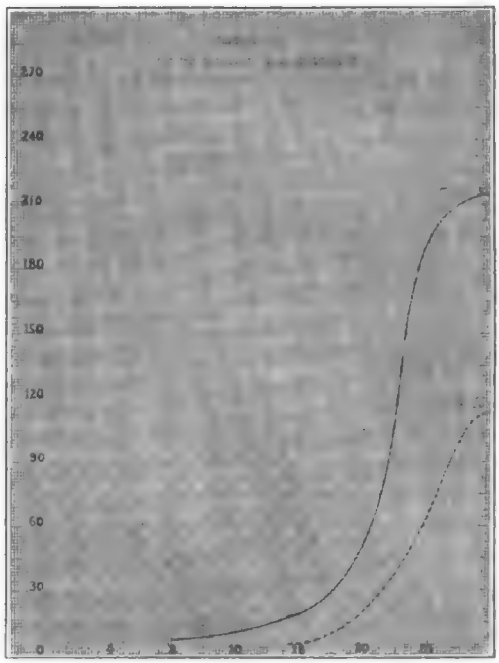


PLATE 8.—CURVES OBTAINED FROM AUDION NO. 2. TOP CURVE—NO. 1, BOTTOM CURVE—NO. 2

as the two electrodes of the audion are known. (Or, following the method of operation as set forth in Plate 6, the voltage to the lamp filament could be reduced, thus enhancing the life of same.) The significant point to be observed is that the sensitiveness of the valve has not been altered. The presence of the magnetic field has simply been to cause a greater concentration of the cathode rays, by deflection of same, to that space between the grid and wing, thus making the gas a better conductor, and hence increasing the current flow between the electrodes, as shown in Curve No. 1.

Curve No. 3, however, exhibits an en-

Google

tirely different state of affairs. Here, the current flow across the gas has been materially reduced, but the increase in steepness of the curve shows how the sensitiveness of the valve has been increased. As set forth in the section entitled "The Principle of the Oscillation Valve," it will take a much smaller increase in voltage across the wing and the grid—the voltage of the incoming electro-magnetic waves—to produce a sound of given intensity in the radio receivers in Curve No. 3 than in Curve No. 2. Hence, the valve when subjected to a field which would cause its natural shape, Curve No. 2, to assume the shape of Curve No. 3, is much more sensitive.

The physical change has been undoubtedly the following: The magnet has deflected the cathode rays out of their normal path between the wing and the grid just enough to bring about a very critical state of affairs. There will be just enough electrons passing between the electrodes to bring the current to the critical point on the curve. In this condition, the magnetic field must be of so weak a strength that the slightest increase of the electric field across the electrodes, i. e., the addition of a small E.M.F., will cause the return to their original path of as many negative ions as possible. Thus, the curve will not only grow steeper, due to the natural characteristics of a saturation curve, but will, in addition, be made more steep by the return of the deflected electrons to their original course, since their return will of course greatly increase the conductivity of the rarefied gas.

The curves in Plates 3, 5, 6, and 7 were obtained from a valve belonging to the writer, which we will call, for brevity's sake, Audion No. 1. Another valve, belonging to Mr. R. B. Abbott, instructor in the Physics Department of the University of California, was also used in the experiments, and will be referred to as Audion No. 2. Both the audions were of the same design.

It had been previously noted by Mr. Abbott and the writer that a magnet in the presence of this valve cut down the intensity of received signals no matter where the magnet was placed. Plate 8 shows curves obtained from this valve. By comparing Curve No. 1 of this plate, which is the usual saturation curve without the presence of a magnetic field, with Curve No. 2 of Plate 7, it will be seen that for equal conditions of filament and electrode voltage, Audion No. 2 passes a much smaller current between the wing and grid than Audion No. 1. Curve No. 2 of Plate 8 shows the only type of curve it was possible to obtain from this valve when subjected to the influence of a magnetic field. (The audions were exactly similar in construction.)

We see from the shape of the curve that it has been lessened in sensitiveness, and that like in Curve No. 3 of Plate 7, a much smaller amount of current passes when the field is on the valve than before it was introduced.

We can see from the fact that a much smaller amount of current is passed by Audion No. 2 between the wing and the grid than by Audion No. 1 under the same conditions, that Audion No. 2 has not been properly constructed to obtain the maximum Edison effect. This may be due to the fact that the lamp was improperly exhausted, or the occlusion of gases by the sealed-in metals after the lamp has been sealed up. In other words, there are not enough electrons flowing between the grid and the wing, for some unknown reason, to serve as a conducting medium for the current. With a defective condition of affairs already existing, the presence of the magnet only enhances it, for after the electrons have been deflected from their normal path due to the feeble ionization of the gas, the introduction of a slight increase in the electric field is not sufficient to cause a return of the electrons to their original path. This is analogous to the setting up of the electric spark. If the gas between the spark dischargers is already fairly well ionized, the imparted velocity given to these ions by the strain caused by the presence of the electric field, i. e., the application of a high E.M.F. to the dischargers, causes them to collide with undissociated molecules of air, breaking them up into ions and finally forming enough ions to permit the passage of the current in the form of the electric spark. Thus, if the gas is poorly ionized at the start, it will take a much greater electric field to produce a given change in affairs than if

(*Continued on page 328*)

Google

Modern Industrial and Military Explosives

A Brief Account of the Composition, Characteristics and Methods of Employment

By Charles Heilman

Illustrations by courtesy of the E. I. du Pont de Nemours Powder Co.

PART TWO

Blasting Gelatin:

It has been indicated before that dynamite, when placed under water, will lose about 6 per cent. of its power, since the nitro-glycerin is liable to be exuded or displaced; while, like nitro-glycerin, it freezes easily, and thawing out the frozen cartridges is a dangerous operation.

To obviate these drawbacks Nobel invented in 1876, blasting gelatin, especially adopted for submarine blasting and blasting in wet ground. This gelatinous material was obtained by the action of nitro-glycerin, either alone or with the help of solvents, on low grade or soluble guncotton. It was made by Nobel by incorporating 6 or 7 per cent. of low nitrated cellulose (collodion cotton or soluble guncotton) with slightly warmed nitro-glycerin. The result is a plastic, transparent material with a specific gravity of 1.5 to 1.6, which may be kept under water for a long time without appreciable change.

AN EXPLOSION OF TWENTY-EIGHT TONS OF DYNAMITE IN A GYPSUM HILL AT THE CEMENT FACTORY NEAR COLTON, IN RIVERSIDE COUNTY, CALIFORNIA

The power of the guncotton contained in the collodion adds to the

Google

power of the nitro-glycerin, so that an equal weight and quantity of blasting gelatin is more powerful than ordinary dynamite and much superior to the liquid nitro-glycerin. But on account of the colloid contexture, it is less sensitive to detonations than ordinary dynamite and explodes only by means of an improved priming. Usually this consists of a priming of fulminate that explodes a small quantity of compressed guncotton which in turn explodes the dynamite.

Blasting gelatin also freezes and is sensitive to percussion in this state. Camphor and other substances have been added to blasting gelatin to render it more solid and less sensitive.

It was dynamite and blasting gelatin which made possible the construction

BORING A HOLE FOR BLASTING A TREE STUMP

of the St. Gothard and the Simplon tunnels in Switzerland. The St. Gothard tunnel was begun in 1872 and it required eight years to complete the work which was started at both ends. Two thousand five hundred workmen were employed daily and the cost amounted to over $11,250,000. It is 9¼ miles in length, 28 feet broad, and 21 feet high, and has a double line of rails. According to the engineers, the construction of this tunnel required 7 lbs. of kieselguhr dynamite, or 5 lbs. of blasting gelatin for every cubic yard of granite.

The Simplon tunnel is 12.4 miles in length. It was begun in 1898, and completed in 1905 at a cost of $14,000,000. It also has a double track, or rather consists of two parallel passages, separated by 39 feet of rock. The construction of the Simplon tunnel required 1,350 tons of dynamite, 4,000,000 detonating caps and bore-holes, and 5,300,000 yards of fuse.

Dynamite has been used to a great extent in the construction of the Panama Canal, and all other modern engineering feats too numerous to mention.

Other explosives:

The progressive steps made in chemistry have in the last fifty years greatly increased the number of explosives. Explosives of the dynamite variety are today facing competition with explosives consisting of two inexplosive ingredients, which, when mixed together, yield a compound capable of violent explosion. Most all of these explosives contain chlorates. They are much safer to handle than dynamite, as they can be transported to the place of operation separately and mixed only when needed. "Cheddite" is the best known of this class of explosives. Cheddite is in a certain way to chlorate of potassium as dynamite is to nitro-glycerin. Chlorate of potassium mixed with a combustible substance forms a dangerous explosive, which detonates at a shock. To deaden its sensitiveness it is finely pulverized in a kind of nitrated oil which congeals around the particles of chlorate (proportions: 80 per cent. pulverized chlorate of potassium in 8 per cent. of castor oil, and 12 per cent. of nitrated substances). The solid product thus obtained may be transported with safety, and explodes only under the action of a detonating cap. It is nearly as powerful as dynamite, costs less, and is less sensitive to cold than the nitro-glycerin products.

In this class may also be included the picric acid compounds, which consist of picric acid or tri-nitrophenol brought into a dense state by fusion and used as a filler for shells. These picric acid compounds are known as "lyddite" in England and "melenite" in France. Their composition is nearly identical. Melenite is obtained by dissolving guncotton in a mixture of 2 parts of ether and 1 part of alcohol, then adding picric acid.

The manufacture of dynamite has increased enormously in the last two decades, and while the total production in 1867, the year of its invention, was but 11 tons, today the yearly output amounts

Google

to more than 65,000 tons in the United States alone. The largest dynamite factory in the world is situated near Ardeer, Scotland; and the most important factories in the United States are situated in the hills east of San Francisco bay.

Fulminates:

The preceding considerations furnish us with an idea of the security of ordinary explosives. An explosive might be compared to a powerful spring held in place by a small catch. If, at the least shock, the catch is released, the apparatus becomes dangerous; but if to loosen this catch a special mechanism must be used, the apparatus becomes inoffensive when the special mechanism is not present.

For dynamite, this special mechanism is the fulminate capsule. It is the detonation of this capsule which "liberates the spring," and thereby unshackles the forces of the explosion.

Let us study a little more closely this priming. Among the explosives there are some which, as we have mentioned above, at ordinary pressure and temperature, will explode by a phenomenon which seems instantaneous, as soon as one of their elements is lighted or shocked. These substances are called detonators and fulminate of mercury is one of them. Others, on the contrary, under similar conditions burn progressively faster or slower—they deflagrate. But they can explode if they are submitted to a high pressure and to a high temperature, or if their decomposition is brought about by the detonation of a fulminate capsule or some similar substance.

Explosives of the first kind are evidently too dangerous to be used in large quantities. They can be used only in a fragmentary state, in particles. But we could not do without them, since without their aid we would not be able to detonate at will less perilous explosives.

Mercury fulminates:

The chief ingredient in detonators and percussion caps is mercury fulminate. It was discovered in 1799 by Howard and first used as a filler in percussion caps about 1815. It is made by dissolving mercury in nitric acid and is a white crystalline substance that is almost insoluble in cold water. Like all fulminates, it is easily exploded and excessively sensitive to percussion. The explosion is very sharp because of the rapidity of its decomposition, but due to the small amount of gases given off the force exercised is not very great. The explosive force of mercury fulminate is not much greater than that of gun powder, but much more sudden in its action. The readiness with which this compound may be fired makes it an excellent means of exploding other substances, as it is essentially a detonating powder and is therefore a requisite for exploding guncotton, nitro-glycerin and its compounds, etc.

Fulminate of mercury is very poisonous like all quicksilver compounds, has a sweet, metallic taste, and is soluble in hot water and concentrated nitric acid.

SETTING OFF A BLAST ON A FARM

SMOKELESS POWDER

Guncotton:

Guncotton and nitro-glycerin were discovered about the same time and are related in their production and properties. Guncotton is an explosive substance obtained by the action of strong nitric acid on cellulose at ordinary temperature. The transformation of cotton fabrics, paper and other forms of cellulose into explosive substances by means of immersion in cold concentrated nitric acid, was discovered by T. J. Pelouze in 1838. He observed that the materials treated in that manner, though not altered in physical appearance, became heavier, and that after washing and drying they possessed self explosive properties. However, it was C. P. Schoenbein who in 1846 first converted cotton waste into the explosive body known as "guncotton."

Google

Guncotton is made by immersing cleaned and dried cotton waste in a mixture of strong nitric and sulphuric acids. The cotton remains in contact with these acids for a period varying from two to four hours, at ordinary temperature, in which time it is almost fully nitrated. The acids are then slowly run off and the cotton washed and boiled.

Guncotton in an air-dry state burns with great rapidity—about eight times as quickly as gunpowder—but it does not detonate unless confined. It burns with a yellowish flame, almost without smoke and leaves little or no residue. The volume of gases formed is very large. The more closely it is confined the greater is the pressure set up by a small part of the burning charge and the more completely will the explosion of the remainder assume the detonating form. A small

A TYPICAL STORAGE BARGE FOR EXPLOSIVES

charge of dry guncotton will detonate the wet material and this peculiarity is made use of in the employment of guncotton for blasting purposes. A charge of compressed wet guncotton can be exploded even under water by the detonation of a small primer of the dry and waterproofed material, which in turn can be started by a small fulminate detonator.

The effect of guncotton in mines is very nearly the same as that of dynamite, for equal weights, but as above stated it requires a stronger detonator.

At its discovery, Schoenbein proposed to use it as a substitute for gunpowder. Many attempts were made to utilize it in that capacity but they all failed. The employment of guncotton as a propellant was made possible only after the discovery that it could be gelatinized or made into a colloid by the action of solvents, such as acetone and a number of like substances.*

Cotton-Powder or Tonite, which was introduced in the United States in 1881, and is manufactured by the Tonite Powder Co., of San Francisco, consists of finely divided or macerated guncotton compounded with about the same weight of nitrate of barita. This compound is pressed into candle shaped cartridges, formed with a recess at one end for the reception of a fulminate of mercury detonator.

Smokeless powder:

From the discovery of black powder till the middle of the 19th century, the art of powder making remained at a standstill, because it was the practice of alchemy rather than the principles of chemistry which may be said to have controlled the manufacture of all explosives. The science of warfare followed the progress of mechanics in improving the gun with a view of increasing the rapidity of flight and the penetrative force of projectiles. Gunpowders and all other explosive mixtures or compounds containing metallic salts must form smoke on combustion, and many were the attempts made to obviate these defects, but as stated above, it was only after the discovery that guncotton could be gelatinized, that the manufacture of explosives used as propellants was revolutionized.

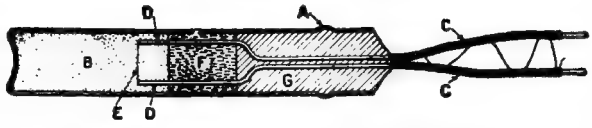
Guncotton is converted into a gelatinous form by several substances, such as ethyl acetate or benzoate acetone and many benzene compounds, most of which are volatile liquids. On contact with the guncotton a jelly is formed which stiffens as the evaporation of the gelatinizing agent proceeds and finally hardens when the evaporation is complete. Whilst in a stiff paste it can be cut, moulded or pressed into any desired

*The so-called collodion-cottons are nitrated celluloses, but of a lower degree of nitration than guncotton. Characteristic differences between guncotton and collodion-cotton are the insolubility of the former in ether or alcohol or a mixture of these liquids, and the extreme explosiveness of guncotton, while collodion-cotton is only slightly explosive. Collodion-cotton has attained a greater importance than guncotton itself through its diversified employment, for instance, in photography (preparation of the exposed plate); in blasting (for the production of explosive gelatin from nitro-glycerin); in surgery (for uniting the edges of wounds); and in the manufacture of fancy goods (celluloid articles, as: combs, collars, cuffs, toilet boxes, etc.).

Google

shape without any danger of ignition. Guncotton alone in the colloid state burns very slowly if in moderate sized pieces. All the smokeless powders, of which gelatinized guncotton or nitrated cellulose is the base, are moulded into some conveniently shaped grains, tubes, cords, rods, discs, or tablets, so that the rate of burning may be controlled as desired.

It is obvious that many advantages were to be obtained by using the new explosives instead of the old powders, chief among them being their smokelessness,* and the property of burning up completely without leaving any residue.



CROSS SECTION OF AN ELECTRIC BLASTING FUSE

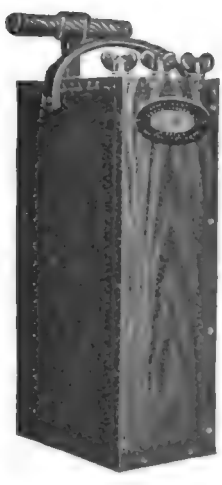
The present smokeless powder industry only dates from the invention of the Poudre B by Vieille, in 1886. This powder consists of a mixture of insoluble and soluble nitro-celluloses, its exact composition being:

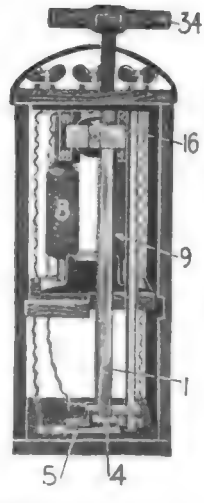
Insoluble nitro-cellulose....68.21 parts
Soluble nitro-cellulose.....29.79 parts
Paraffin ..... 2.00 parts

The addition of paraffin serves to diminish its sensibility to shock and to retard its rate of combustion.

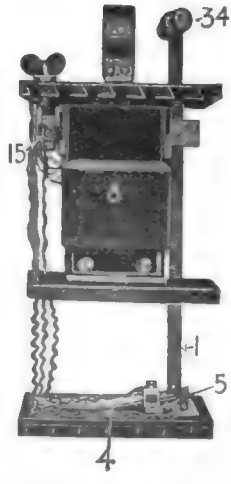
Poudre B is claimed to be almost absolutely smokeless. It leaves no residue in the gun, except a few unconsumed grains. It is of the consistency of hard rubber, honey yellow in color, and translucent. In the Lebel rifle (standard gun of the French army), a charge of 43 grains of this powder produces a muzzle velocity of 2,050 feet per second with 3,350 lbs. of pressure per square inch.

While Poudre B was used with great success in France, other countries were vainly trying to realize it. Nobel invented "Balistite," and about the same time "Cordite"—the name of the smokeless propellant in use in the British army and navy—was produced. This material is made in the form of cylindrical rods or strings of varying thicknesses by pressing the material, whilst in a soft and pasty state, through dies or perforations in a steel plate, by hydraulic or screw pressure, hence the name cordite. The thickness or size varies according to the nature of the charge for which it is


A TYPICAL BLASTING MACHINE



INTERIOR FRONT VIEW OF BLASTING MACHINE



INTERIOR SIDE VIEW OF BLASTING MACHINE

*All of the present so-called smokeless powders produce a little fume or haze, mainly due to the condensation of the steam which forms one of the combustion products.

(*Continued on page 366*)

Google

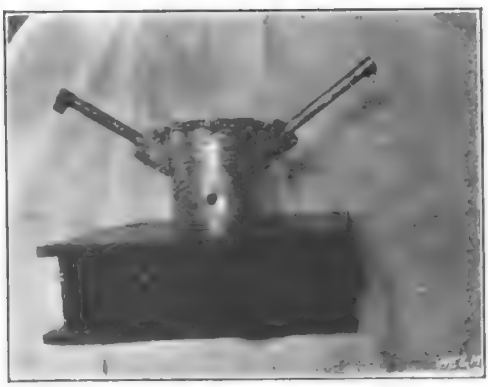
A New Arc Generator for High Frequency Current

By Philip E. Edelman

THE advantages of continuous waves for radio work are daily becoming more obvious. Any up-to-date textbook will cite at least six advantages for these waves, so we need not take up time for discussing them here. Of the various methods for their production, Poulson's arc generator is perhaps the best known, although high frequency alternators, notably the recent Goldschmidt embodiment, deserve at least equal attention.

At first sight the Poulson embodiment of Duddell's principle appears ideal, but when one comes to the construction and use of his arc there is a difference in opinion. Aside from the complicated arrangement, there are certain evident mechanical difficulties in using the gas supply in this device.

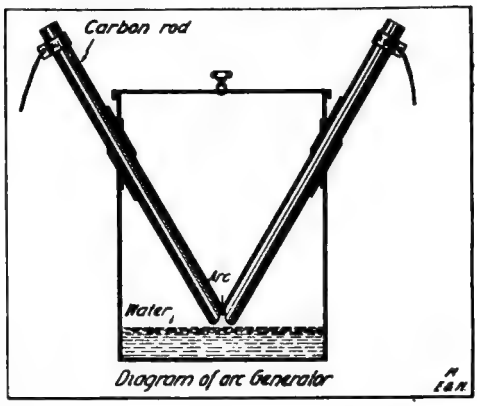
During some recent experiments the writer devised a new form of generator in which the need of a separate gas supply, gas tight joints, and a complicated construction are avoided. This generator, which is used in substantially the same manner as the usual arc, is shown



VIEW OF A READILY MADE ARC GENERATOR FOR HIGH FREQUENCY CURRENTS

in the accompanying diagram, in which the essential parts are clearly indicated.

It will be noted that the electrodes are of a material that generates its own gas as these electrodes are brought to incandescence. Flaming arc or magnetite electrodes are suitable for this purpose. They are also inclined at such an angle as to throw the hot gas upwards, thus drawing in a cooler supply that also contains some water vapor taken from the bottom of the container. The electrodes are maintained at a uniform distance by suitable means, and the device works continually as long as current is supplied at the terminals. The electrodes, too,



are of such nature that they burn several times as long as would similar carbon electrodes. The level of the water is maintained just below the arc, as shown, by means of a simple outlet and bypass, not indicated in the sketch. In experiments with modifications of this arc, foreign electrodes and cooled electrodes of other materials were tried, but the best results were obtained with the arrangement shown.

Experiments with this device have shown that it is suitable for very high frequencies, and in view of the novel features, including the simple design, it is suitable for the demonstration of radio-telephony and telegraphy, as well as for the treatment of certain ailments of delicate human organs in therapeutics. In all cases a very steady and dependable arc is maintained—a condition essential to successful work.

The forest service collected 40,000 pounds of tree seed last year for use in reforestation work. The total area reforested was about 30,000 acres.

If you mean "No," say "No"—unless you are a woman.

Google

New Resistance and Heating Units

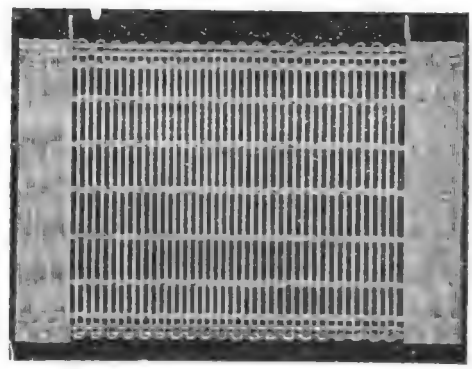
GREAT strides have recently been made in electric heating appliances while a reduction of the price of electric current in almost every city has rendered it possible for electric heating to become a universal convenience.

The most important part of any electrical heating or cooking utensil is the heating unit. Not only must the cost of this part be taken into consideration, but the extra cost of mounting and working the unit into various appliances, its efficiency for transforming electric current into heat, and other similar factors must not be overlooked in the manufacturing of heating and cooking devices.

In the accompanying illustrations is shown a new heating unit that has recently been tested out by some of the largest electrical manufacturing companies. Not only has this unit been adopted by many of them, but the experts of these concerns have pronounced it to be the best so far produced.

In order that any heating unit be rendered efficient, it is necessary to have it contain as little metal as possible. Under such conditions all the heat generated is imparted more rapidly either to the surrounding air or into the surface where the heat is to be transmitted. The unit described in this article contains no metal other than the wire itself and is therefore most suitable for electric stoves, electric radiators, car heaters, foot warmers, hot plates, incubators, and all varieties of electric warming and cooking devices. It is also especially adapted for meter testing work, motor starters, controllers, power stations and for other similar purposes. It is an excellent substitute for lamps inasmuch as it is unbreakable, portable and easily mounted, not to mention its lower cost. A 1,500 watt unit complete weighs but five ounces.

In one of the accompanying views is shown an electric unit composed of high resistance material. The material employed has a resistance of over fifty times that of copper. It is interwoven back and forth with pure asbestos cord. This construction insures the unit against becoming deformed as is often the case with resistance wound in spirals. Another feature gained by this design is the simplicity with which connections may be made every few inches, so that when this unit is employed in rheostats the connecting strips can be arranged in such a manner that the motor will start smoothly. These units are unbreakable and can be employed with great reliability and efficiency for all types of crane and railway controllers which are subjected to violent vibration. It is claimed by the manufacturer that these units are much cheaper than any others now on the market; this being accounted for by the fact that they contain less material and are therefore less expensive to manufacture. They are also very much lighter for they contain no metal outside of the wire itself.



ONE OF THE NEW RESISTANCE UNITS

The new resistance units are made in many different sizes and in several styles. They can be made in any shape or size and for any carrying capacity up to 700 amperes. When made in the form of a band or cord, they are said to be far superior to spiral or grid resistances.

Among the many applications of these new heating units one of the most noteworthy is an electric radiator weighing but five pounds and which can be attached to any electric light socket.

Google

Construction of a Quenched Gap

By Earle C. Hanson

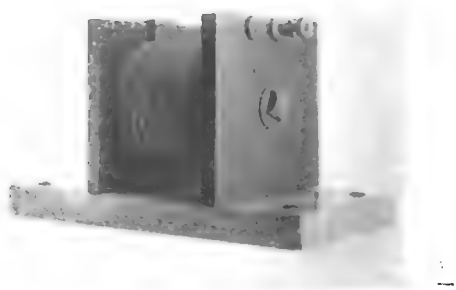
THE Lepel arc, the Telefunken series of Lepel arcs and the Peukert gap in oil between a fixed and a rotating disc, are very efficient and practical forms of quenched spark gaps. All of these possess in common the characteristic of a very short spark gap provided with means for rapid cooling so as to effect a speedy restoration of the high resistance of the gap after the energy has left the primary circuit. The credit for foreseeing the importance of this requirement and of indicating means for attaining it belongs to Professor Max Wein.

SOME OF THE PARTS COMPRISING A SIMPLE QUENCHED GAP

The quenched gap is economical in transmitting energy, practically noiseless, easy to control, emits a persistent train of oscillations, and has a low logarithmic decrement, thereby complying completely with the new wireless law. A quenched gap built according to the specifications of this article will fully repay the experimenter, by the increased efficiency he can obtain from his transmitting apparatus.

The two end pieces are cut from ½ inch fiber, 4 inches square. Through the center of each piece a ¼ inch hole is drilled. Twelve copper discs are turned down till the surface is true. The thickness being ¼ inch and the diameter of each 1½ inches. A ½ inch hole is next drilled through the center of each plate and a larger drill is then used to drill half way through from each side. One of the accompanying views shows the gap taken apart and clearly brings out the construction of the disc, also the outer groove and the thin rim of the plate that is used to prevent the current from sparking across on the outer portion of the disc where the rubber rings are placed. The rubber rings are cut from ⅛ inch material and the rim is ¼ inch wide. Two rubber plates 1½ inches in diameter and with a ½ inch hole through their center are used as end washers. The square end pieces have binding posts screwed to the fibre and are connected with the end copper discs by means of strips of copper. A 6 inch bolt, ⅛ inch in diameter is passed through one of the end pieces and then several layers of empire cloth are tightly wound on the bolt so as to just allow the twelve discs to fit over the bolt. The rubber rings are placed between each pair of metal plates. The other end piece is then placed on the bolt and a nut screwed on. The gap is then completed and placed on a marble base. The other illustration shows the completed quenched gap.

The writer has tried the Lepel gap with two of the plates used on the quenched gap described above, obtaining highly satisfactory results.



COMPLETELY ASSEMBLED QUENCHED GAP FOR AMATEURS

From the two illustrations the reader can get a much better idea of the actual construction of a Telefunken gap than a drawing could possibly furnish. Any other dimensions can be used, but the main aim of the author has been to make it small, neat and reliable.

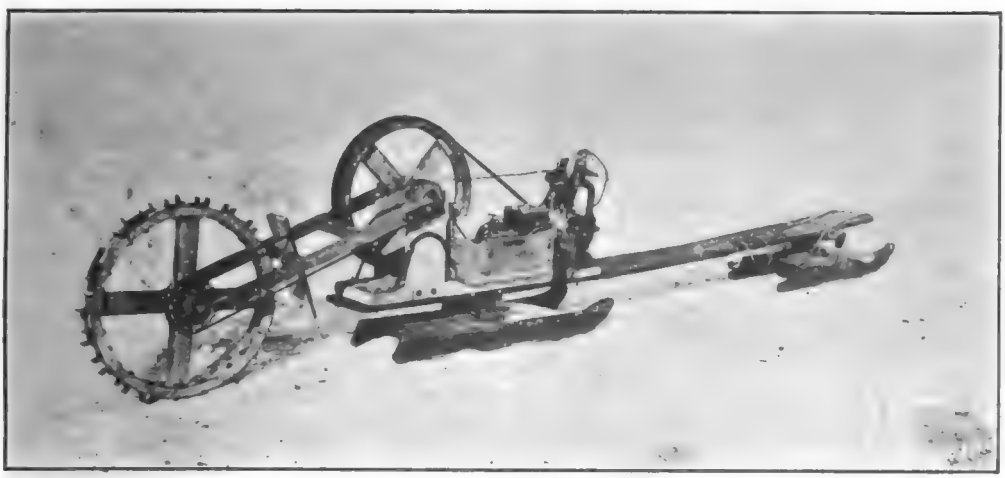
Google

The quenched spark is well known in Europe and is fast taking its place in America in a variety of types. *Modern Electrics* published a most interesting article in the November, 1913, issue on this topic.

It would be well in closing to suggest that the experimenter read the work by George W. Pierce, *Principles of Wireless Telegraphy,* for a detailed description of the working of the quenched arc.

AN AUTO-SLED FOR THE YOUNG FOLKS

A. Arthur Jewett, of Skowhegan, Me., has recently perfected a double-runner motorcycle combination that is an object of envy among the youngsters about town. He removed the engine from a regular motorcycle and mounted it to the rear end of the bobsled. The engine is belted to a large pulley on a counter shaft, and the latter is connected by sprocket and chain to the driving wheel. The driving wheel is set in the rear end of a movable frame pivoted on the corner shaft so that it rises and falls readily to cover all inequalities in the road. The rim of the driving wheel is studded with sharpened steel calks to give a firm grip upon the snow. Mr. Jewett gets a speed of about 20 miles per hour. It will go up the highest grade that is found on the ordinary road at the rate of from 12 to 15 miles per hour.—*John E. Taylor.*



A NOVEL FORM OF MOTOR-DRIVEN BOBSLED, SHOWING THE MOTORCYCLE ENGINE, BELT DRIVE AND THE TOOTHED DRIVING WHEEL AT THE REAR

A 400 H. P. FRENCH AIR SHIP

The accompanying illustration shows the French dirigible airship "Commandant Coutelie," constructed at Puteaux by the Societe "Zodiac," and equipped with two six-cylinder gasoline motors of 190 h.p. each. These gasoline engines operate at a normal speed of 1,000 revolutions per minute. They drive two propellers, each 4.5 meters in diameter, at a speed of 500 revolutions per minute. The two motors are situated 24.5 meters apart and propel the airship at a speed of 62 kilometers per hour. The fuel tanks can hold sufficient fuel to operate both motors at normal speed and power for 20 hours.

FRENCH DIRIGIBLE AIRSHIP "COMMANDANT COUTELIE" IN FLIGHT

The total weight of the airship with two pilots, two observers and four me-

Google

chanics is said to be 2,200 kilograms. This dirigible airship has a gas volume of 9,500 cubic meters and a fabric surface of 3,250 square meters. It has two balloonets of 3,600 cubic meters and a total length of 92 meters, with a diameter of 14 meters.

The envelope is made from double fabric caoutchoute with a wind resistance of 1,600 kilograms or 400 gramms per square meter. The framework of the car is 40 meters long and 2 meters high with a width of 1.3 meters. It is located at a distance of 5 meters below the balloon. The total height of the airship including the balloon and car is 21 meters. The balloon has proven very successful in many flights.—*Frank C. Perkins.*

The New London Radio Station

By R. A. Dio

WITHIN the past four months the signals from a new station have made themselves manifest over a considerable area and possibly the readers of MODERN ELECTRICS AND MECHANICS would like some first hand information regarding it. The station in question is that located at New London, Conn., the call letters of which are WLC.

The station is located about two miles from the city of New London, on the banks of the picturesque Thames River, not very far from the course where each year the Yale-Harvard crews battle for victory, and is about a mile from the open waters of Long Island Sound. It is privately owned, and was built for the owners in 1910 by the Massie Wireless Telegraph Co., of Providence, R. I., but has only been recently equipped for long distance work.

The initial purpose of building such a large plant was, and still is, to maintain a direct communication with the company's powerful wrecking steamer which is also equipped with radio-apparatus. The station is, however, open to public service, under the London Convention rules, and handles all the commercial business, at the East end of Long Island Sound, from the steamers equipped with the Fessenden System.

There are at present two complete transmitting sets installed here, which are both used as circumstances dictate. The principal set consists of a two kw., 500 cycle, synchronous rotary set, which is manufactured by the National Electric Signalling Company, under the Fessenden patents. It is similar to the sets installed on some of the steamers of the United Fruit Company and comprises a 5 h.p., 60 cycle D. C. motor, flexibly coupled to a 500 cycle A. C. generator, while on the same shaft with the rotor of the generator is mounted the rotary spark gap enclosed in an adjustable muffling case to which the fixed electrodes are fastened. The rotating wheel of the gap is a steel disc with copper sparking

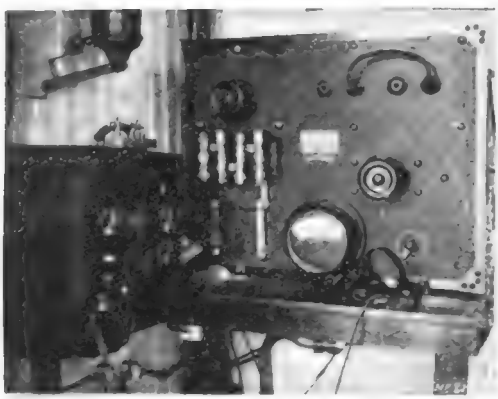
VIEWS FROM THE TOP OF THE AERIAL MAST: AT THE LEFT MAY BE SEEN THE CITY OF NEW LONDON, WHILE AT THE RIGHT IS THE MOUTH OF THE THAMES RIVER

Google

points set in the edge. These points are made in the shape of a small wedge which approaches the stationary point broad side on; the discharge taking place from the sharpened end.

The transformer is of the open-core type, standing about four feet high and is fitted with protective gaps for excessive strain. The condenser is of the well-known compressed air dielectric pattern and a constant pressure of 250 pounds is kept on the plates at all times.

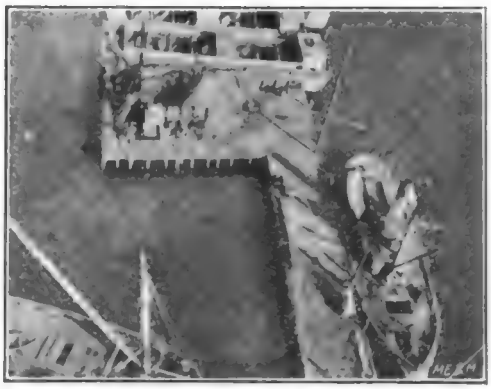
The switchboard which controls the large set stands about six feet high and upon the upper panel are mounted two circuit-breakers, an A. C. ammeter, a frequency meter and a voltmeter with interchangeable plug, in order that it may be used for either A. C. or D. C. machines. On the central panel are the controlling switches and the rheostats,



PRESENT RECEIVING APPARATUS AND SWITCHBOARD FORMERLY USED

while on the lower division is mounted the automatic starting device, by means of which the operator is able to start the generator by simply pushing a button besides the transmitting key.

This comprises the long distance set. The auxiliary set is a ½ kw., 60 cycle set which is operated directly from the street mains. The same condenser and oscillation-transformer are used on both sets. The rotary gap of the small set is operated by a small induction motor on 110 volts through an impedance coil and has a milled wheel of brass with eight sparking points. These, together with the inductance coils of flat copper strip wound on edge—of which there are three—besides the oscillation transformer which is made in a like manner, complete the description of the apparatus in the generator-room. It is to be regretted that no photographs could be obtained



LOOKING DOWN FROM THE TOP OF THE AERIAL MAST

of this room, but it is hoped that this description will give the reader a fair idea of the transmitting sets.

The combined receiving room and office contain the transmitting key and receiving apparatus, of which the accompanying view will give a good idea. It is the regulation Fessenden receiver and is very selective. The signals from Mare Island, California, have been recorded here and those from the Canal Zone and Guantanamo are continually heard with great distinctness. On the operating desk is a direct Western Union wire to New York and New England points.

LOOKING UP THROUGH THE CENTER OF THE AERIAL MAST

The tower supporting an antennæ of fifteen phosphor-bronze wires five feet

(*Continued on page* 344)

Google

Electrical Equipment of the Panama Canal

Almost as Marvelous as the Canal Itself are the Centralized Control and Indicating Systems

Illustrations by courtesy of the General Electric Co.

THE electrical specification, design and manufacture of the Panama Canal centralized control system may properly be regarded as one of those undertakings which, from an engineering standpoint, not only arouse a lively interest, but also present an opportunity for much valuable instruction. The interest results mainly from the immensity of the canal project itself, and the instruction from a consideration of the methods employed to insure the passage of even the largest ships afloat across the isthmus with speed and safety. The complete operation of the canal locks, terminals and auxiliary equipment utilizes electrical energy throughout, with the present exception of the Panama Railroad, the electrification of which is under contemplation.

The specifications for the entire generating, lock controlling, and distribution system for operating the Panama Canal were prepared under the supervision of Mr. Edward Schildhauer, electrical and mechanical engineer, Isthmian Canal Commission, assisted by a staff of able electrical engineers, including Mr. C. B. Larzelere, who was closely identified with the lock control problems, and Mr. W. R. McCann with the generation and distribution of power. These specifications exhibited great care and painstaking engineering. They contained every safeguard that expert engineers could suggest, were exact and explicit in regard to the results required, yet gave proper range in the details of accomplishment.

GENERATION AND DISTRIBUTION

The power system for the operation of the locks, towing locomotives, lights for the locks and buildings, and motors not directly connected with the lock control, is composed of:

A 7500 kv-a, 2,200 volt hydroelectric power plant at the Gatun Dam;

A 4500 kv-a, 2,200 volt Curtis turbo-generator electric power plant at Miraflores for emergency, lately used to supply power for construction work;

A double 44,000 volt transmission line across the Isthmus, connecting Cristobal and Balboa with the two power plants;

Four 44,000—2,200 volt substations, stepping down at Cristobal and Balboa, and up or down at Gatun and Miraflores, depending on which of the two plants is supplying power;

Thirty-six 2,200—240 volt transmission stations for power, traction and light at Gatun, Pedro Miguel and Miraflores locks;

Three 2,200—220—110 volt transformer stations for the control boards at the locks;

Stations at Cristobal and Balboa for coal handling plants, machine shops and dry docks.

The system of connection throughout employs a double bus, double switch scheme, with provision for disconnecting any oil switch for cleaning or repairs without interrupting the circuit. In the power house and the four 44,000 2,200-volt substations, the oil switches are solenoid operated and are installed in concrete cells, above which are concrete fireproof compartments containing the two sets of buses. In the thirty-six transformer stations in the lock walls, the oil switches are hand operated. All 2,200-volt oil switches have disconnecting switches, so arranged that live parts are completely covered.

The instrument and control board for the Gatun generating station is of natural black slate, as are all the switchboards for the power system. It is totally enclosed by means of grille work with doors at each end. The switchboards for the transmission line substations are of the vertical type, with control apparatus and mimic connections symmetrically arranged on the middle section of the panels. The rear of the board is enclosed by means of grille work with doors at each end.

POWER SUPPLY AND CONTROL PANELS FOR LOCK MACHINERY MOTORS

Current for the lock machinery and towing locomotives is transformed from the 2,200-volt system in the immediate vicinity of where it is used. There are a total of thirty-six transformer stations, for all locks, each containing duplicate 200 kva. 3-phase 2,200 240-volt trans-

Google

formers for power, and one single-phase 25-kva. 2,200 220-110 volt transformer for lighting. The stations, normally fed from the 2,200-volt buses in the 44,000 2,200-volt substations, can also be operated from the power plants; the stations at Gatun locks from the Gatun hydroelectric station; and the stations at Miraflores and Pedro Miguel from the Miraflores emergency steam plant.

To give an idea of the number and sizes of motors to be controlled in operating the lock machinery, the following table is interesting:

Machines and Operation.	Motors each Machine and H.P.	Number of Motors. Gatun.	Ped. M.	Mira.	Total.	Total Horse Power.
Miter gate, moving, each leaf.....	1—25	40	24	28	92	2300
Miter gate, miter forcing.....	1— 7	20	12	14	46	322
Fender chain, main pump.....	1—70	16	16	16	48	3360
Fender chain, operating valve.....	1— ½	16	16	16	48	24
Rising stem gate valve.....	1—40	56	24	36	116	4640
Cylindrical valve	1— 7	60	20	40	120	840
Guard valve	1—25	6	6	6	18	450
Auxiliary culvert valve.....	1— 7	4	4	4	12	84
Totals.....		218	122	160	500	12020

There are many motors not included above, as, for instance, those for the spillway gates, for the hand rails on the mitering gates, and for the sump pumps. The spillway gates are remote controlled from a special control board.

LOCATION AND OPERATION OF LOCK MACHINERY

From an operating standpoint the machinery was placed below the coping of the lock walls, thus affording a clear space for maneuvering ships and protecting the apparatus from the weather without erecting numerous houses.

The mitering gates consist of two massive leaves pivoted on the lock walls which operate independently of each other. A pair of gates is located where each change of level occurs and divides the locks into 1,000-foot chambers. In addition to these gates, at lake and ocean ends are duplicate pairs of gates used as guard gates. To handle the vessels of various sizes with the minimum use of water, mitering gates of the same description as those above are installed, dividing 1,000-foot locks into two compartments. These gates are termed intermediate mitering gates. When the mitering gates are closed they are what might be termed clamped in this position by a device called a miter forcing machine.

On the top of all mitering gates a footwalk with hand rails is provided. When the gates are opened and in the recesses provided for them in the lock walls, these hand rails would interfere with the passing of the towing locomotives, except in the case of the lower guard gates. The hand rails are therefore made to be raised and lowered. This is done by a motor under the footwalk, controlled from the lock wall.

The chain fenders are stretched across the canal in front of all mitering gates which can be exposed to the upper lock level and also in front of the guard gates at the lower end. These chains are maintained in a taut position when the gates behind are closed, and are lowered when the gates are opened for the passage of a ship. The chains are raised and lowered by a method similar to that followed in hydraulic elevators, with the additional feature that if a ship approaches the gates at a dangerous speed and rams into the chain, the chain is paid out in such a way as to gradually stop the ship before it reaches the gates. Lowering the chain for the passage of a vessel and raising it again after the vessel has passed is accomplished by two motors: one driving the main pump supplying water under pressure, and the other operating a valve which controls the direction of movement of the chain. These two operations are combined in one, each motor being stopped automatically by a limit switch when the motor has performed its function.

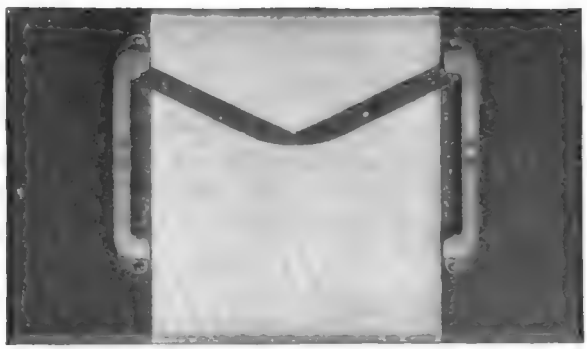
The filling and emptying of the locks is accomplished by three culverts, one in the middle wall and one in each side wall, the flow of water being controlled by rising stem valves. They are located in the

Google

culverts at points opposite each end of each lock so that the culvert can be shut off at any desired point for filling a lock with water from above, or upstream, or for emptying it by allowing it to flow out and down to the next lock. Lateral culverts conduct the water from the main culverts, under the lock chambers, and up through openings in the lock floors.

REASONS FOR USING THE CONTROL SYSTEM ADOPTED

As the flight of locks at Gatun, for instance, extends over approximately 6,200 feet, and the principal operating machines are distributed over a distance of about 4,000 feet, it can be readily seen that central mechanical transmission of control of machines would be almost impossible; and to control the machines locally would mean a large operating force distributed practically along the full length of the locks, which has invariably been the practice heretofore. Such a force would be difficult to coordinate into an efficient operating system. The situation therefore resolved itself into centralized electrical control, which reduces the number of operators, operating expense, and liability to accident. To accomplish this system of control, a control board for each lock was constructed which permitted having all control switches located thereon mechanically interlocked so as to minimize, if not entirely prevent, the errors of human manipulations.



INDICATOR SHOWING THE POSITION OF MITERING GATES

CENTRALIZED CONTROL AND INDICATING SYSTEM

The control boards are installed in control houses located on the middle walls at points which afford the best view of the locks, although this view is not depended on to know the position of the gates or other apparatus, as all are provided with indicators on the control board. The control boards are made approximately operating miniatures of the locks themselves, and are arranged with indicating devices which will always show the position of valves, lock gates, chains, and water levels in the various lock chambers; and with the exception of such machinery as needs only an "open" or "closed" indication, the indications will be synchronous with the movement of the lock machinery.

For such indication, appliances with commutators, multiple contacts or ratchet mechanisms would not be suitable because of the many contacts and small pieces in their construction; and particularly because devices of this character move step by step and would not indicate all points in the movement of the main machinery, such indications being more or less approximate according to the number of steps in the indicating devices. The indicators on the Panama control boards were developed especially for this undertaking, and show accurately and synchronously every movement of the machinery to which they are connected, whether in the extremes of travel or at any intermediate point between the two extremes.

A complete synchronous indicator consists of a transmitter located at and operated by the machine in the lock wall, and a receiver operating an indicator at the switchboard in the control house. Both transmitter and receiver have a stationary and a rotating part. The stators have 3-phase windings with leads from three corresponding equidistant points brought out and connected together, but not connected to a source of power, the stator coils being energized by induction from the rotors. The rotors are bipolar and are connected in multiple and energized from a 110-volt 25-cycle single-phase source.

The movement of the lock machinery and with it the connected transmitter rotor produces a field in the transmitter stator polarized in the direction of the

Digitized by Google

rotor axis, which induces voltage in the stator coils. This voltage is transmitted by the 3-phase connection above mentioned, to the receiver stator coils and duplicates in them but in the reverse direction, the same conditions of polarity and voltage as present in the transmitter. The rotor of the receiver being energized by the external source in the same direction as that of the transmitter, is reacted upon by the polarized receiver stator until the magnetic axes coincide and the rotors of both transmitter and receiver are in the same relative position. Any difference in the position of the transmitter and receiver rotors causes a difference of potential between the stator windings with a consequent flow of current and resultant torque, which again moves the receiver rotor to the same relative position as that of the transmitter rotor. The receiver rotor follows closely and smoothly the movement of the transmitter rotor, and consequently imparts to the position indicator a movement identical with the movement of the lock machine, although on a scale reduced to the requirements of the control board. A brief description of the individual synchronous indicators follows:

CONTROL HOUSE AT GATUN, SHOWING TRACK FOR TOWING LOCOMOTIVES

In the case of the mitering gates, the vertical operating shaft is connected to a shaft which operates the transmitter machine. The latter shaft is threaded and carries a nut on which is mounted a rack. The rack engages a gear on the rotor shaft, and this turns the rotor as the gates operate. The mitering gate indicator comprises a pair of aluminum leaves, shaped to correspond to the plan view of the top of the gate, which travel horizontally just above the top of the board, the hinge ends being connected to shafts extending down through the surface of the board where they are geared to the receivers by means of bevel gears. When the miniature gates are completely opened, they are covered by shields to give the effect of the gates folding back into recesses in the lock walls.

For the chain fender, the position indicator transmitter is driven by the shaft which operates the limit switch that controls the stroke of the piston. The indication on the board is given by a small aluminum chain, which, like the large chain, is raised and lowered, each end operating independently, the large chain being lowered to the bottom of the lock and the small chain into a slot on the control board. The ends of the miniature chain are fastened to semaphore arms which are connected to segmental gears meshing with the driving gears in the receiver machines. As the receiver rotors turn, the chain is either lifted or lowered, the position of the large chain from the bottom of the lock being indicated by the angle of the semaphore arms.

As the rising stem valves occur in pairs, their position indicator machines occur in pairs also. The transmitter rotor is driven by a shaft and gearing similar to that described for the mitering gates. Each indicator is similar to a small elevator, a car being used to indicate the position of the valve gate. Both front

(*Continued on page 346*)

Google

FIG. 1.—COMPLETED INKSTAND, SHOWING ITS ATTRACTIVE APPEARANCE

An Attractive Inkstand

Made in Marble or Alabaster and Artistically Decorated With Copper Mounts

By Geo. F. Rhead

Illustrations from drawings made by the author.

OUR illustration, Fig. 1, shows an inkstand for execution in Alabaster, or Pentelikon Marble. The former is one of the softest marbles and consequently easiest to work, though its soft and brittle nature necessitates especial care in handling. The marble work is enriched with beaten copper mounts, applied at the front of the ink-containers and also to the lids of same, with a small mount, but one productive of some considerable effect, applied to the centre of the base. The stand is supported upon a wooden base, preferably of ebony, to provide against fracture in moving. The ink-containers are made separately from the base, but are cemented thereto upon completion. They fit into shallow recesses cut to receive them.

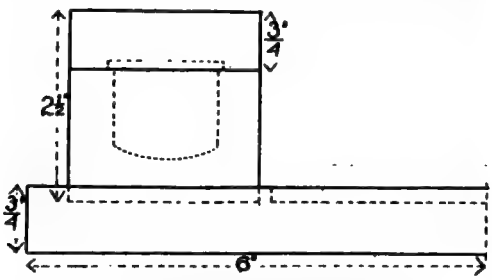


FIG. 2.—SIDE VIEW OF ONE OF THE INK CONTAINERS AND BASE

The plan and elevation of the inkstand with measurements are given in Figs. 2 and 3. From these it will be observed that to make it there will be required three pieces of marble; one measuring 12 x 3¼ x ¾ inches, for the base, and two 2½ inch squares for the two ink containers. These may be procured without any difficulty from any monumental mason at a trifling cost, who, for a little extra, will cut them to the necessary shape. This is, however, not a very difficult matter to undertake

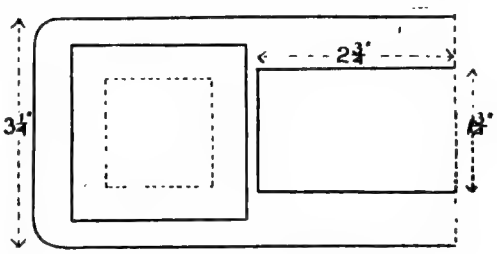


FIG. 3.—TOP VIEW OF ONE OF THE INK CONTAINERS AND BASE

Google

oneself if necessary, for alabaster can be cut quite easily with an ordinary saw, and pentelikon marble can be cut similar-

FIG. 6.—BIT USED FOR BORING HOLES IN MARBLE

ly, providing a little patience is taken over the work. The marble requires to be firmly fixed during the operation, such as by wedging it between blocks of wood screwed to the bench. An old saw should preferably be used, as marble cutting is not likely to improve its cutting powers, but, of course, the sharper

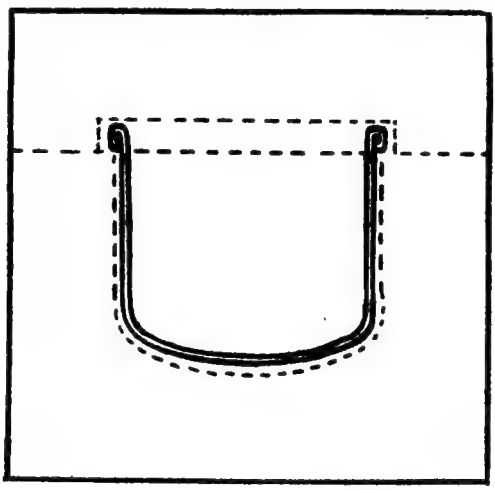


FIG. 7.—INK CONTAINER AND LID

it is the better. The cut should, from time to time, during the cutting, be fed with water, and care should be taken to cut vertically, or a great deal of work

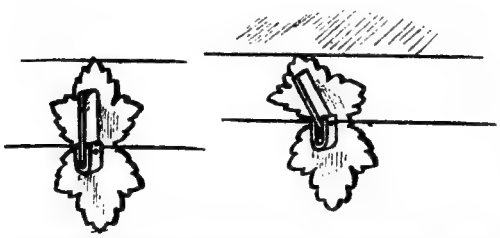


FIG. 8.—TWO VIEWS OF THE COMPLETED HINGE

will be occasioned afterwards with the chisel. Supposing a piece of marble has been roughly hewn to the size of the base, the first operation will be the trueing up of the under surface by chiseling off all irregularities in the way of projections, and rasping until a perfectly flat surface is secured. Two stone-mason's chisels are shown in Fig. 4: One is flat at the end like an ordinary chisel, while the other takes a curved form like

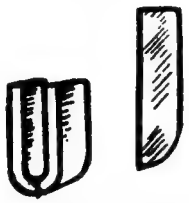


FIG. 9.—TWO PARTS USED IN MAKING THE HINGE

a gouge, the latter being the most generally used. It should be kept as sharp as a razor, and then the work will be found to go quite easily. During the chiselling, the marble must be kept perfectly rigid, and to effect this two pieces of wood are screwed at each side of the block, to an absolutely rigid bench.

In chipping, the blows are lightly given, the action of the chisel being to cut rather than to chip off pieces. When the surface is almost flat, finish by rasping until it is quite regular. Fig. 5 shows a useful form of rasp used by marble workers for the small corners and angles. The marble is then turned over and firmly secured, and it should be noted if

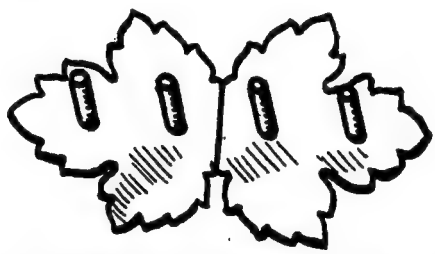


FIG. 10.—VIEW OF THE BACK OF THE HINGE

it lies perfectly flat on the bench, for should it not, it will be extremely liable to fracture during the chiselling of the hollow parts in the upper surface.

The simplest method of hollowing the shallow recesses in the base of the stand, would be to drill a series of holes the full depth of the recess along the center, in the deepest part of the recess. This depth should not be more than 3/16 inch as a deeper recess will only tend to weak-

Google

en the stand. The method of working is to chisel round the edges of the holes and repeatedly enlarge them until the boundary lines of the recess are reached. This is always the best method to adopt if a recess has to be cut, whatever its shape. Drill a hole to the depth of the required recess, and enlarge the hole. A small chisel of curved section is the best to adopt for the early stages of the work, and it should be kept well sharpened. An ordinary archimedian drill-stock, with the form of bit shown in Fig. 6, will be found to do the drilling as efficaciously as any.

FIG. 5.—A TYPE OF RASP THAT WILL BE FOUND VERY EFFECTIVE IN WORKING THE MARBLE

FIG. 4.—TWO FORMS OF CHISELS—THE UPPER ONE HAS A FLAT END LIKE AN ORDINARY CHISEL, WHILE THE LOWER ONE TAKES A CURVED FORM AT ITS END

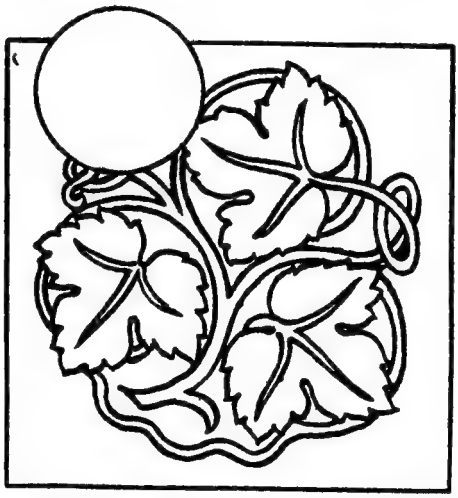


FIG. 11.—TOP VIEW OF ONE OF THE INK CONTAINERS, SHOWING DESIGN AND HANDLE

After the square of marble that forms each ink-well and cover has been trued and brought to a finished state with the rasps, its exact shape is set out on the stand, and a shallow recess accurately cut to fit each one. A line is then accurately marked around the sides ¾ inch from the top of each and a slice of marble sawn off to form the lid. The circular hole that forms the ink-well is then sunk in the larger piece, adopting the plan previously mentioned of drilling to the depth and enlarging the hole with chisels. Considerable care is necessary to avoid fracture. No heavy blows must be administered and any attempt made to hurry the work by removing large fragments will tend to cause a breakage. A shallow recess is cut in the lid as shown in the elevation, Fig. 2, to fit over the rim of the ink-container, (see Fig. 7).

An extremely simple form of hinge and one that is very suitable for the purpose in hand, is shown in Fig. 8. It consists of two pieces of metal, one bent into the form of a U and the other a

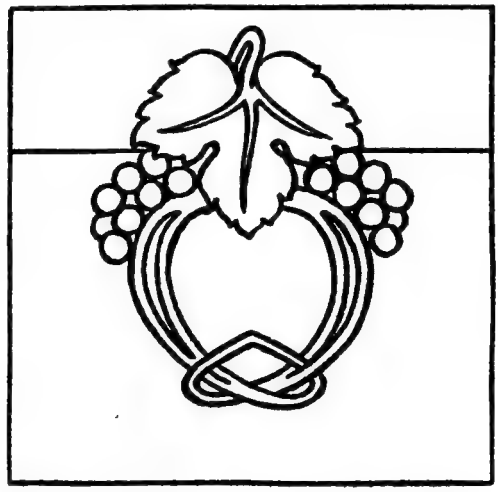


FIG. 12.—FRONT VIEW OF INK CONTAINER, SHOWING THE DESIGN WITH THE LID CLOSED

Google

small flat piece which has one corner rounded off that fits into the U-shaped member, a metal pin being passed through the whole, and burred at the ends to keep it in place. Copper can be used for making these parts. Each section is soldered to a metal plate, Fig. 9, which can take an ornate form; a simple leaf shape being as good as any. Each plate has two pins soldered to the back that are inserted in holes drilled to the marble, Fig. 10. The holes should be slightly larger than the pins, so that a little cement may be introduced between them. A good cement for the purpose is plaster of paris and glue. Also, white of an egg mixed with freshly burnt lime to form a creamy substance, is an excellent one. The back of the plate and holes are covered with this, and then tightly brought together, when the surplus that exudes from the edges can be cleaned off. The handles of the lids need little description. To make one, a small piece of marble is brought to a globular form by rasping, and a hole drilled for the insertion of a stout piece of copper wire. The top of the lid is also drilled to take the handle at an angle, as shown in Fig. 1.

There only remain now the copper enrichments, the working patterns of which are given in Figs. 11 and 12. The leaf portion depicted in Fig. 12, as will be noticed, is separate and affixed to the lid, and thus, when the ink-pot is closed, overlaps the lower portion as shown in Fig. 13. The method of attaching these parts is by means of the small dowels previously referred to and illustrated in

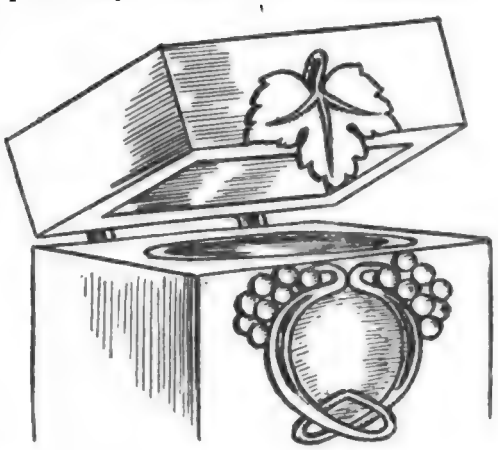


FIG. 13.—A VIEW OF ONE OF THE INK CONTAINERS WITH THE LID PARTLY OPENED

Fig. 9—*i. e.*, inserting the dowels or pins in holes drilled in the marble, and securing them with a liberal application of cement.

A very charming bronze-green color can be given to copper by the application of a solution of potassium sulphide which will be found to harmonize excellently with the color of the marble.

The Panama-Pacific Exposition and the Kahn Act

By George William Miatt

IN the January edition of this publication we had something to say about the Kahn bill, passed ostensibly for the protection of foreign exhibitors at the Panama-Pacific Exposition. As was anticipated, a storm of protest against the absurd incongruities, the impracticability and injustice of this law—conceived in ignorance and passed in haste, to be regretted at leisure—has swept over the country—the industrial portion of it at least—and indignation is unconfined. The bill was and is so clearly unconstitutional that no one seems to have given it serious thought at first, nor to have believed its passage possible. It is only another illustration of the lack of serious consideration bestowed upon legislation by the average politician in the absence of motives more sinister than the public welfare.

It would seem that the repeal of the act is inevitable; nothing short of that will suffice. Certainly it could never withstand the legal scrutiny of the Supreme Court of the United States, if ever submitted thereto. The defects of the measure are, however, so obvious that it is not likely to survive long enough to be subjected to such a crucial test. Already, efforts are being made to denaturize the bill by amendment, and while Bulkley's proposed revision would help matters in part, it does not strike at

Google

the root of the evil, nor eliminate all of its absurdities. But it does seek to remedy the most undesirable feature of the original by stipulating that exhibits shall not enjoy the gratuitous protection provided in the Kahn act if they have been *"in public use or on sale in this country,"* or have *"become the property of another under the laws of this country."* Hence, the foreign exhibitor, if he desires to protect his product here, might as well apply for a United States patent in the regular way should the Bulkley amendment be passed, and the absurdity of attempting to prevent an American manufacturer from producing an article unpatented and unpatentable in this country, but patentable abroad, will be eradicated—the burden of proof then being imposed upon the foreign exhibitor of showing that a resident of the United States is an actual infringer. A foreign manufacturer who contemplates exhibiting his wares at San Francisco undoubtedly intends to do so mainly for commercial reasons, and if his object is to interest citizens of the United States in his product through the medium of the exhibition, and he wishes to maintain a monopoly thereof in this country for the legal period, the obvious and equitable course is for him to protect himself in the manner prescribed by the Constitution and the patent laws of this country. These are very impartial and generous, particularly where foreigners are concerned. Some excuse might be tolerated for the Kahn act if there existed any possible discrimination against foreigners; but from its very inception this country has set an example to the world in fully extending to aliens the same measure of patent protection accorded to its citizens. The Kahn act, if legal, would place the American manufacturer of an article or product unpatentable here at a disadvantage as compared with a foreign rival competitor holding a foreign patent—it would, in fact, put him out of business insofar as concerned that particular article or product, and virtually make American citizens subject to the vagaries and inconsistencies of foreign patent law and practice.

Why the exposition authorities should have been so overzealous for the protection of prospective foreign exhibitors as to father such a bill is a mystery. Foreign countries have never extended to exhibitors of other nations such exposition rights and privileges as those provided for in the Kahn act. Furthermore, it is deceptive and misleading in that it justifies foreigners, unacquainted with the *un*constitutionality of the act, in the belief that by exhibiting at San Francisco they can acquire monopoly in the United States in inventions or devices which would unquestionably be construed as public property here. If the law is not repealed what will be the feelings of such exhibitors, and what will be their remedy, if after seeking to benefit by the provisions of the Kahn act, they find themselves thrown out of court, and a laughing stock before the world? Will they not be apt to consider it a questionable Yankee trick—in short, a variation of the "con" game heretofore so prevalent and effective in this country? Would not the effect be to discourage confidence in this nation's sincerity, and put a quietus on the exploitation of future international exhibitions, of which the world has had a surfeit during the last two generations. As yet, not all the Governments of Europe have expressed official willingness to participate in and contribute to the success of the Panama-Pacific Exposition; and a farcial law like the Kahn imbroglio would be a deterrent rather than an incentive.

THE SAYVILLE WIRELESS STATION

The Sayville wireless station, located on the southern shore of Long Island, is said to be the largest commercial wireless station in America at the present time. It is owned and controlled by the Atlantic Communication Company, and employs exclusively the Telefunken system. The station not only sends out press messages to the Debeg stations, but also handles all the commercial business for ships equipped with Telefunken apparatus. The sending of press messages at night is only a small part of the work done by this station during every 24 hours.

Massachusetts is believed to lead all of the States in its percentage of motor-propelled vehicles.

Google

Construction of Small Alternating Current Motors

Complete Working Instructions for the Building of Small Alternating Current Motors in Several Sizes

By A. E. Watson, E. E.

Illustrations from drawings made by the author

PART I*

Directions for constructing a single-phase alternating current motor of one-half horse power, supplied from 100 to 110-volt, 60-cycle circuits. Four poles, 1,800 rev. per min.

As the builder will be interested not alone in the general appearance of the machine itself but of its wiring and external starting accessories, a representation, partly actual and partly diagrammatic, is given in Fig. 1. Since at best the motor demands a large starting current,—two to three times the normal running value,—a separate circuit from the distribution center should be provided. Ordinary house wiring circuits are run with No. 14 wire, and these are supposedly sufficient in size to permit the operation of the full number of lamps, but not of the motor in addition. Insurance and lighting companies are likely to insist upon this separation of circuits, and the user, for his own convenience, should prefer it. For the case of 100 to 110 volts supply, the motor circuit

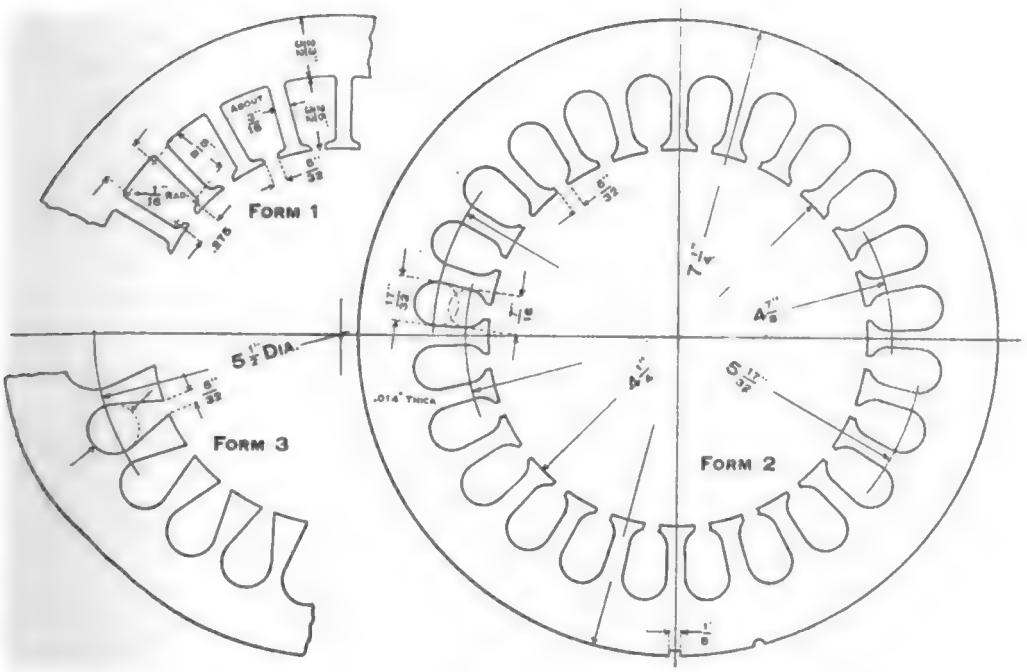


FIG. 4.—SHEET IRON FOR STATOR OF MOTOR SHOWING SEVERAL PRACTICAL FORMS OF SLOTS

should be of wire not smaller than No. 12. The energy consumed by the motor at full load will be considerably less than a kilowatt, therefore a single break switch will be permissible. In the diagram for the regular connections a dou-

* This series began in the February issue.

Google

ble-pole, double-throw switch is shown, —the "baby" or a 25-ampere size being sufficient,—but it really has only the single break effect. By tracing the circuit

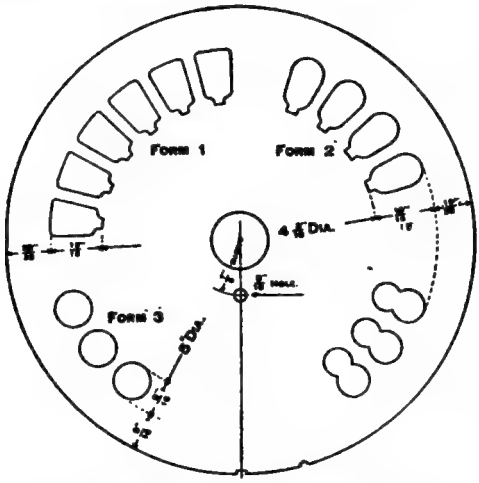


FIG. 5.—STATOR SHEET IN PARTIALLY COMPLETED CONDITION, SHOWING SLOTS AS PUNCHED WITH AID OF INDEXING MACHINE

it will be found that one line wire passes through a fuse directly to one side of the motor without entering the switch at all. If the supply system is of the "grounded" sort, this should be the grounded wire, as can readily be tested by finding that a lamp will not be lighted when attached between it and a water or gas pipe. Though this wire be permanently connected to the motor, it represents no "live" conditions. For this reason, in some cities, a fuse in this line would not be required or permitted. The other wire is certainly to be fused, and connects with both hinge contacts of the switch. When motor is not running, the switch is to be left open, straight out, and to prevent accidental closing in the lower or starting position, a spring should be arranged to press out the blades, and only when forced in by hand against the spring will the circuits be closed. Removal of the hand should at once be followed by automatic opening of the switch.

To start the motor the switch is temporarily to be closed in the lower position. Current will then flow in two circuits,—one through the reactance and the main windings of the motor, the terminals of which are at binding posts numbered 1 and 2; the other through the resistance and the starting windings, of which the terminals are at 3 and 4. With the connection between the two windings joining posts 2 and 4, as shown, the motor should start in a certain direction, and in a few seconds accelerate to about two-thirds speed, and then the switch should quickly be thrown into the upper position. This change results in opening the starting-coil circuit and short-circuiting the reactance. The motor then runs under normal conditions. If the other direction of rotation is pre-

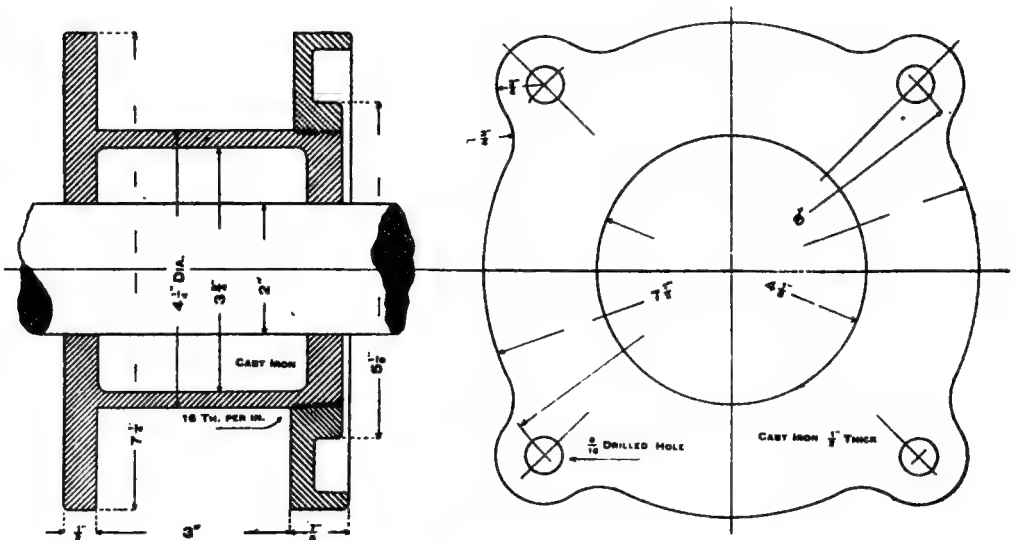


FIG. 6.—FIXTURES FOR USE IN PREPARING HOME-MADE STATOR SHEETS

Digitized by Google

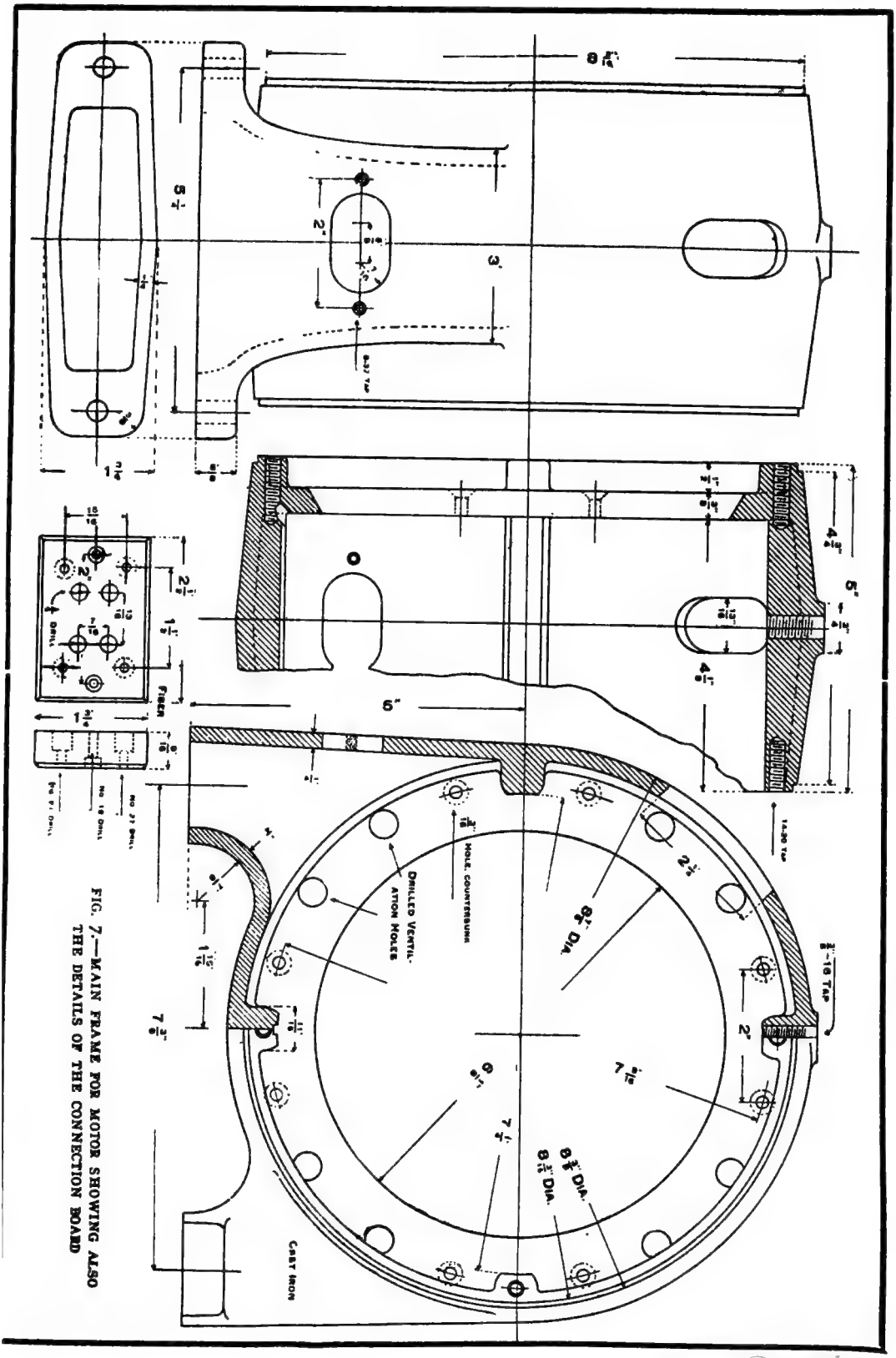


FIG. 7.—MAIN FRAME FOR MOTOR SHOWING ALSO THE DETAILS OF THE CONNECTION BOARD

Google

ferred, binding posts 2 and 3 may be connected to the grounded side of the supply, 1 and 4 to the live side. The reader will understand that terminals 1 and 3 may as well be connected together and to one supply wire, and the two wires from other side of line be lead to terminals 2 and 4. If the double break effect in main switch is preferred, it can be secured by substituting one of the standard triple-pole, double-throw sort, two of the blades being connected as shown, and the third providing for the other side of the line, as shown in the diagram under "alternative connections." A two-bladed switch can still be used to accomplish the same result by providing

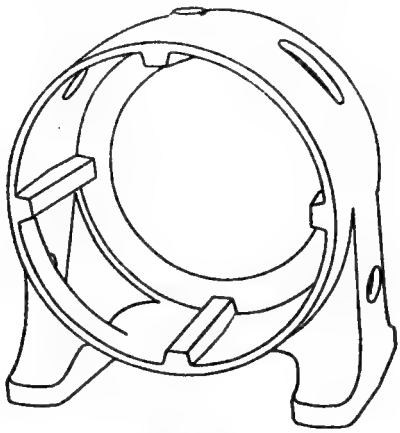


FIG. 8.—PERSPECTIVE VIEW OF FRAME CASTING IN THE ROUGH

an additional contact, as shown in the same diagram. Descriptions of the construction of suitable resistances and reactances will be given in the proper place, but details of the motor itself are evidently of first interest.

Fig. 2 shows a longitudinal section, representing both mechanical and electrical features. A cast iron frame, or housing, holds a mass of sheet iron discs between a fixed and a movable flange, each side of the stack being provided with a fiber sheet of identical shape, serving to hold the slender teeth of the discs and to prevent the wires from being brought into contact with sharp metallic edges. In the slots, in a manner to be described later, are wound first the starting coils, then the running coils. On both sides of the frame are fitted dish-shaped covers of cast iron which serve to hold the bearings. These latter are of the reliable oil-ring type, carefully designed to give copious lubrication without leakage or throwing of oil. The rotor is of the short-circuited, or "squirrel-cage" type, having an odd number of copper rods embedded in round slots near the edge of the discs and thoroughly soldered to copper rings at each end.

A few overall dimensions are given; completed, the machine weighs about 60 pounds. The pulley shown is only suggestive, for the builder would need to modify its dimensions to fit his particular requirements. An essential condition is that it be a good fit upon the shaft, provided with key as well as set screw, one end of hub being of sufficient length to serve as oil deflector and a limit to the end motion. In Fig. 3 is given an end view of the completed motor, bringing out the appearance of the rotor rods and one of the end rings, also the four groups of stator coils, though the actual courses of the wires are concealed by the protecting tape. The end castings are seen to be held by four equally spaced screws, therefore, at will, the bearings may be turned to fit floor, wall, or ceiling position of motor.

I.—SHEET IRON FOR STATOR.

Difficulty in getting sheet iron for the stator is likely to prove the first and greatest obstacle in the way of the builder. If the finished sheets are at all purchasable, and economy of time is any object, they should be bought, and even at an apparently high price will be cheap as compared with the laborious and wasteful methods of producing home-made substitutes. Possibly the builder will prefer to be independent and to desire the credit or experience of carrying out the entire construction. As a guide to these various selections, several alternative shapes of slots and teeth are shown in Fig. 4, the diameters of 4¼" inside and 7¼" outside being necessary for all. The material should be the softest sheet iron or steel procurable. What is known in the trade as "blue steel" is acceptable, as is also the grade used for tinware. Indeed, for a person living in the vicinity of a canning establishment, there should be favorable conditions for getting the iron of closely the right diameters. If the regular grades of transformer steels are available, that with

Google

silicon alloy is now recognized as having the least magnetic losses. Whatever sort be used, it should be thin, not over .014", or about No. 28 gauge. A final stack measuring, when closely pressed, about 2¾" high, will be required, but when separated by tissue paper, the space occupied will be fully the 3" allowed in the design. If the sheets are separated with shellac or asphaltum varnish a little more iron may be used. If the thickness of stock is .014", about 200 discs or punchings will be required.

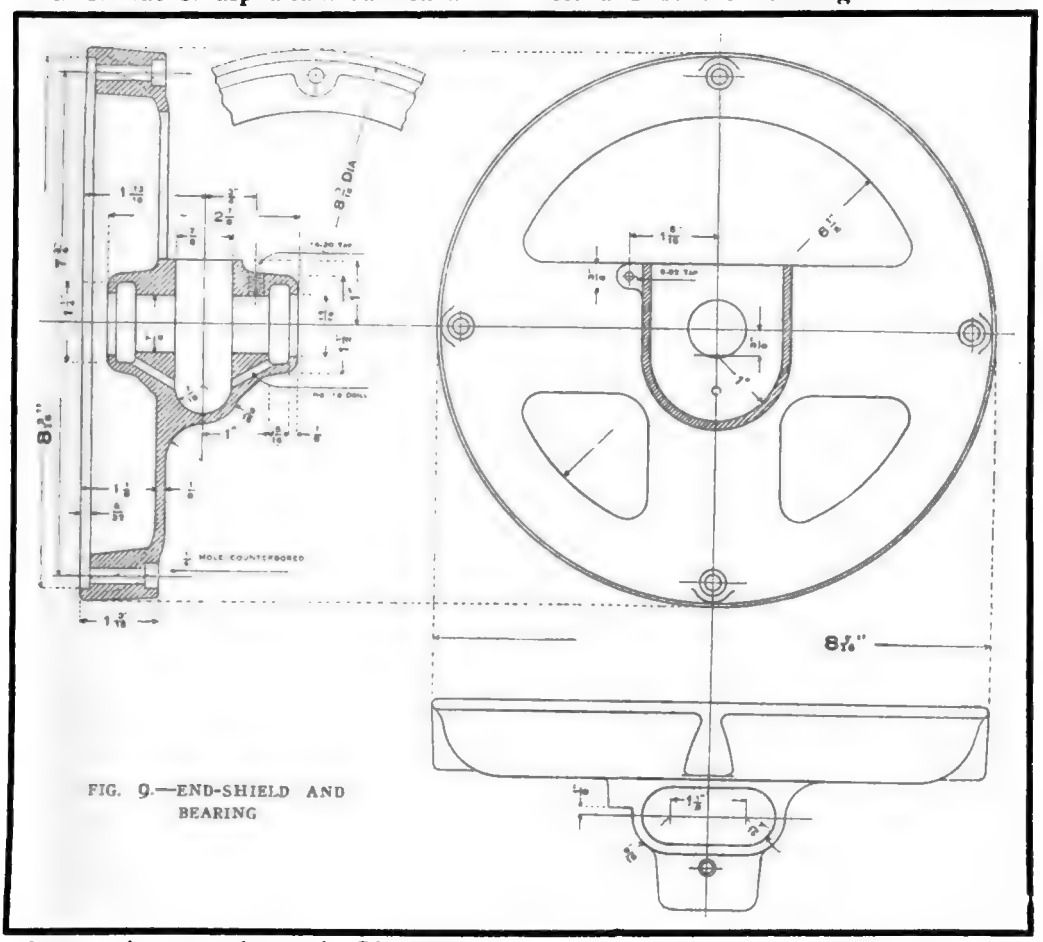


FIG. 9.—END-SHIELD AND BEARING

Form 1 represents the most desirable shape of slots, for this gives the greatest economy of material and room for wire, but unless the builder is unusually well provided with tools he may not be able to make this shape, though it is the sort to purchase. Form 2 is the next best shape, and can be made by use of two sizes of round punches and a moderate amount of filing. Form 3 is least economical, but maybe the most practicable shape for many builders, especially if a little less than one-half horsepower will satisfy the builder's desires; this shape can be obtained by drilling and hack-sawing.

For those who cannot or do not purchase the ready-made sheets, several procedures remain, one being to get blank discs of correct outside and inside diameter and do the notching in a suitable manner; a second to get blanks of full outside diameter, but having a central hole much smaller, such as might be adapted for the rotor. (See Fig. 5.) Using this central hole and a well-fitted pivot, the notching can readily be accomplished in some such simply made tool as was described in the *Electrician and Mechanic* in the February, 1907, issue. In the lack of such a tool or time to make one, a strong drill press may be brought into requisition. The die is to be securely clamped or screwed to the platen of the press and the die inserted by its taper

Google

shank into the spindle. Any looseness in the direction of rotation can be taken care of by attaching a dog to the upper end of spindle, and pulled always to one side by a spiral spring. The index wheel cannot be over 4″ in diameter, or it will interfere with the die. There should be a stud ⅞″ in diameter on which it can turn, and a round pin to match a hole in the sheet and give definite location to all the slots. As it is practically impossible to make an index wheel so accurate as to permit matching in all possible positions, an additional mark should be put somewhere on the sheets to serve as a guide when punching, and finally for assembling in identical order. Such a mark is shown on one edge of the sheet, and should always be kept in the same relative location to the pinhole. It is possible to make the rectangular keyway serve sufficiently with the pin-hole for this purpose if only the two are not purposely placed on exactly the same diameter, for then if a sheet gets placed upside down, the failure of the two marks and slots to match will lead to a detection. Even when the blank sheets are at hand, a necessary preliminary operation will be to cut the pin-hole and keyway. One sheet at a time may be cut by providing a suitable fixture in a hand press, or in some other sort of device a stack may together have the hole drilled and the keyway filed or milled.

FIG. 10.—PERSPECTIVE VIEW OF END-SHIELD CASTING IN THE ROUGH

With a single setting of the central stud there may be punched 24 holes of the sample shape shown as Form 1, or Form 2 or Form 3, in Fig. 5, but with two different settings, the Form 2 shape of hole can be obtained with use of two different round punches, as already suggested, and the sides made straight by filing. The next step will be to have the central portion punched out to a diameter of 4¼″, and the builder will be fortunate if he can find a shop that will do it. However, with the singly or doubly punched round holes, a lathe operation to remove the central portion will be practicable, and indeed with the other shape of slots, provided the narrow openings are not as yet attempted, but reserved for the operation of a hack saw and file.

In order to punch the slots in sheets that have the 4¼″ central hole, a fixture must be provided for the punch press, or requisitioned drill press, that consists of a cast iron disc about 7″ in diameter and of sufficient thickness to hold the die near one edge and permit the rotating on it of a ring that is at once the index wheel and holder for the sheet. This latter fits into a recess perhaps ⅛″ deep, prevented from turning by engaging with a key. A distinguishing mark assures that the sheets once notched in a certain position can always be assembled in identical order.

If by either of these methods any suspicion exists that inside and outside holes are not exactly concentric, the sheets must be assembled on some such arbor as is shown in Fig. 6, and a chip turned off in a lathe.

In case that even the semi-prepared discs cannot be procured, but the builder is compelled to work them out of the raw material, the situation is not hopeless. The expense may be quite as great as if the finished pieces were purchased, for he must provide accessory castings and waste a good deal of stock. A standard size of thin sheet iron or steel of fine quality is 28″ by 84″ and .014″ thick. Six such sheets will be required, and should first be cut into 7½″ squares. Thirty-three will be obtained from each large sheet, the remaining strip 5½″ wide not being wasted, for in addition to rotor discs, iron will be needed to provide for the core of the reactance yet to be made as well as for various experimental purposes to which the builder can with profit apply it. Two washer-like castings, about ½″ thick, as shown in Fig. 6, are to be provided, between which the mass of sheet iron can be tightly clamped onto the face plate of a

Google

stiff lathe. Care should be taken to see that the assemblage runs reasonably true. Now with a thread-tool so held in the tool post as to let one edge scrape against the side of hole in the casting, let a cut be taken through the first sheet. It will come out in a crumpled shape. Then cut through the next one, and so on. Frequent sharpening of the tool may be necessary, and rather a ragged appearance may result from the first passage. A regular boring cutter can then be substituted, and the final hole given a fine finish to exactly 4¼" diameter.

The next step will be to make a cast iron arbor, as also shown in Fig. 6, but for convenience it is to have a removable smaller arbor, but this latter can readily be found in any well equipped machine shop. A piece of shafting or even a piece of cast iron will suffice, but it must be specially trued for this use. If no punch-and-die work is to be performed, the flange of this large arbor is to be marked off in a circle 5½" in diameter, and carefully divided into 24 equal parts. If a milling machine is available for this dividing, it should be employed, but if not, compass methods alone remain, but by dividing first into quarters, then subdividing the quarters, a fairly accurate piece of work can be done. Prick-punch the locations and then drill through the flange with a small drill,—one of about the diameter that will match the point of a 9/16" twist drill. This small hole will help guide the larger drill.

Assemble the sheets upon this arbor, and proceed to cut off the square exterior with a thread-tool, carefully forcing the way through one at a time. As the pieces come off in rather wicked shapes, the hands must be kept well out of the way. By persistence, a fine looking exterior will finally be obtained, and this should be made closely 7¼" in diameter. The small arbor should then be driven out and the 9/16" holes drilled down through the mass in the 24 marked places. As soon as the first hole is drilled, a well fitting rod should be dropped in, such as will prevent shifting of the sheets during the remainder of the drilling. If not previously performed, the arbor can be restored and the rectangular keyway and some distinctive mark filed, milled, or sawed across the exterior edges of the sheets. The sheets can now be permanently removed from the arbor, but reassembled upon two rods or bolts, and by clamping in successive positions in a vise, the locations of the openings of the slots can be marked with a hack saw or file. If the builder has good courage, he can make the entire cuts with a hack saw, so as to obtain the shape of slots shown in Form 3, of Fig. 4, or after marking, the sheets can be cut, one at a time, 48 cuts per sheet, with the points of metal shears. This latter process is tedious and somewhat distorts the teeth, and when finally assembled in the frame of motor requires some filing to remove overhanging edges. The hack saw method, too, requires some embellishment with a file, but gives good results. The writer made his first alternating current motor in this manner, and while once is enough, he can attest its practicability.

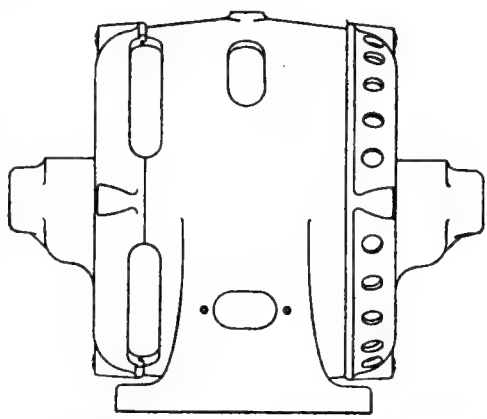


FIG. 11.—FRAME AND END-SHIELDS ARRANGED FOR INCREASED VENTILATION

An estimate of the cost of home-prepared stator iron may be of interest. The six large sheets will weigh about 55 lbs., and at a fair price of 5½c. per lb., the cost will be a little over $3.00. When reduced to the form of plain discs of proper outside and inside diameters, the weight will be 22 lbs. Therefore, except for the narrow strips that might be utilized, the builder could just as well afford to pay 14c. per lb. for such blanks. When the largest size of slots are cut the final weight of the stack of iron would be only 14 lbs., therefore, he could just as well afford to pay 22c. per lb. for the finished article. Added to this elevated price, which still represents only the raw material, he could well afford to pay enough

Digitized by Google

more to represent his own saving in time and cost of accessories.

Whatever be the method of procuring the ultimate notched sheets, they ought to be annealed, and this for the very last operation before painting and assembling in the frame. Unless means are at hand for accomplishing this in a proper manner, it may be omitted, for the owner cannot afford to lose any of the sheets by burning. A muffle should be used, but as a makeshift method one sheet at a time may be heated on a red hot piece of cast iron or boiler plate.

The thinnest material for separating the sheets, for preventing the flow of eddy currents, is thin asphaltum varnish. If used, it must be put on with a brush, one side only of the iron requiring treatment, and the sheets laid out flat to dry. If dipped and hung up, drops will form and harden on certain places, and seriously interfere with a proper assembling. In consequence of its cleanness, tissue paper is more attractive to use, but it occupies more space, and there is considerable difficulty in removing those portions corresponding to the slots. Burning out the superfluous paper is about the easiest method.

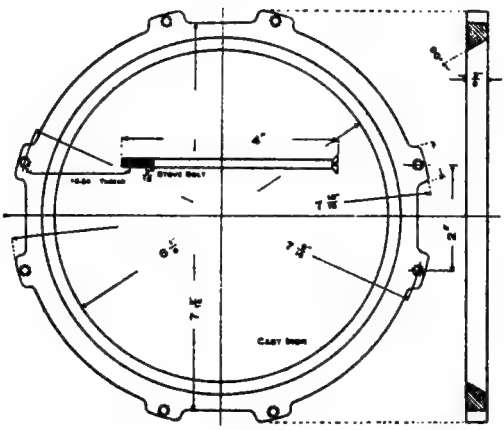


FIG. 12.—RING FOR CLAMPING STATOR SHEETS IN FRAME

Fiber end-plates have been mentioned, and their use is a great insurance against cutting of the insulation. An experienced winder may be able to devise substitutes in the form of wooden wedges, but the builder is urged to take every precaution to make his first machine a success. Not so much is at stake in subsequent machines, and in their making the builder will have devised his own reliable insulating methods, but at first he should take the fewest chances. The space occupied by the fiber may be begrudged, but when sharp edges of iron have cut through the insulation of bottom layers, there is no recourse but to rewind whole coils. To make these fiber discs from the large sheets, 7½" squares may first be sawed out and then held by a screw in each corner to a wooden face plate on a lathe. Inside hole may be cut to 4¼" in diameter, then outside cut to its size, the screws holding until the last instant. The location of the slots can be marked off by using one of the iron sheets as a pattern, and then large central holes made as suggested for the Form 3 style can be cut, using a carpenter's wood bit rather than a twist drill. The final enlargement of the holes to match the iron can well wait until after assembling in the frame, and then the familiar methods with hack saw and coarse file will be found effective.

2.—THE FRAME.

With the small clearance that is requisite between stator and rotor, good alignment and centering of bearings is of first importance. This result is best obtained by providing a cast iron housing, or frame, into which the stator sheet iron shall fit and be well clamped, and to which the end castings that contain the bearings may be properly attached. Such castings should be light, and due recognition given to the fact that curved lines and rounded external corners give a pleasing and symmetrical appearance. It is not much more trouble to make a good looking machine than one that is ugly. Certainly if a pattern is to be used for more than one casting, some expression of care and refinement in design may be tolerated and even expected.

In Fig. 7 are given several dimensioned views of a frame that will comply with these requirements. Fig. 8 shows the perspective appearance of the casting, in the rough. A hollow cylinder is cast with two legs, while four longitudinal ledges serve to hold the sheet iron centrally and against a flange near one end. Two ventilation holes are cored in the

(*Continued on page* 339)

Google

Experimental Department

This department is maintained for the purpose of encouraging the experimenter to develop new ideas. Every reader is welcome to contribute to this department. Contributions should be written on one side of the paper only, using as many sheets as are necessary. Typewritten contributions employing double spacing are preferable. Good sketches are not necessary, as our art department can work up rough sketches that are clear enough to illustrate the idea. Sketches must be made on separate sheets from those containing the description. Return postage must be enclosed if return of unused manuscript is desired.

Three prizes of Five, Two and One-Half Dollars and One Dollar are awarded for the three best ideas published each month. Other contributions are paid for at space rates.

FIRST PRIZE

A D'ARSONVAL GALVANOMETER

The following is a description of a D'Arsonval galvanometer which I have constructed and which closely approximates those in use in laboratories and schools.

The permanent magnet shown in Fig. 1 is taken from a magneto. It is first annealed by heating, then the holes are drilled, as shown, and it is then rehardened and magnetized.

Next, a piece of wrought iron 1 inch square is cut just long enough to fit snugly between the poles of the magnet. In the center of this piece a ¾-inch hole is drilled, as shown in Fig. 2. Holes are drilled and tapped in the ends to correspond to those at Fig. 1, and it is then cut with a hacksaw, as shown at B, Fig. 2. These pieces are then fastened to the poles with four 3/16-inch round-head screws.

A base is now made, preferably of black walnut, 6½ inches in diameter and 1 inch thick. A slot is now gouged out in this block to receive the bottom of the magnet, as shown at C in the completed view. Three holes are drilled through the base, near the edge, at equidistant points, and tapped to take ¼-inch thumb screws. These are to be used for leveling. Two holes are also drilled near the front for binding posts.

The magnet is now placed in the slot and fastened to the base with a strip of brass shown in Fig. 3. This strip should be bent down to a right angle on the lines marked Y and up on those marked X. These lines are ⅛ inch apart. A very small hole is drilled in the center of this piece, and a piece of brass or copper wire inserted. One end of this wire is formed to the shape of a hook, and the other is riveted over and soldered. A piece of fiber paper is placed between this piece of brass and the magnet for insulation. The ends of the brass strip fit into recesses cut in the base and are fastened with two wood screws ¾ inch long. Before fastening it in place a piece of wire is soldered to the bottom of the front of the brass and run through the base to a binding post. In fastening the magnet care should be taken to have its sides perpendicular to the base.

Two uprights are now made of black walnut, as shown in Fig. 4, 1¼ inches wide at the top and 1⅜ inches wide at the bottom. These are securely fastened to the base alongside the magnet, as is shown in the completed view. Before placing the right hand upright in position a piece of brass should be made, as shown in Fig. 6. This piece is 1/16 inch thick, and its edge D forms a bearing over which the pieces E and F, Fig. 7, swing. These should be a fairly loose fit. The long end of the piece E is now inserted through the ⅜-inch hole in the magnet and the piece G is fastened to the magnet with a ⅛-inch round-head screw. The right hand upright must now be fitted over plate G and a ⅜-inch hole must be drilled to allow the short end of piece E to project through. This piece E, as well as the piece H, Fig. 9, is to hold the moving system when not in use.

A piece of black walnut, ⅜x1¼x2¾ inches with a 3/16-inch hole drilled in the center of the 1¼-inch side is now fastened with glue, and screws between the ends of the uprights.

Digitized by Google

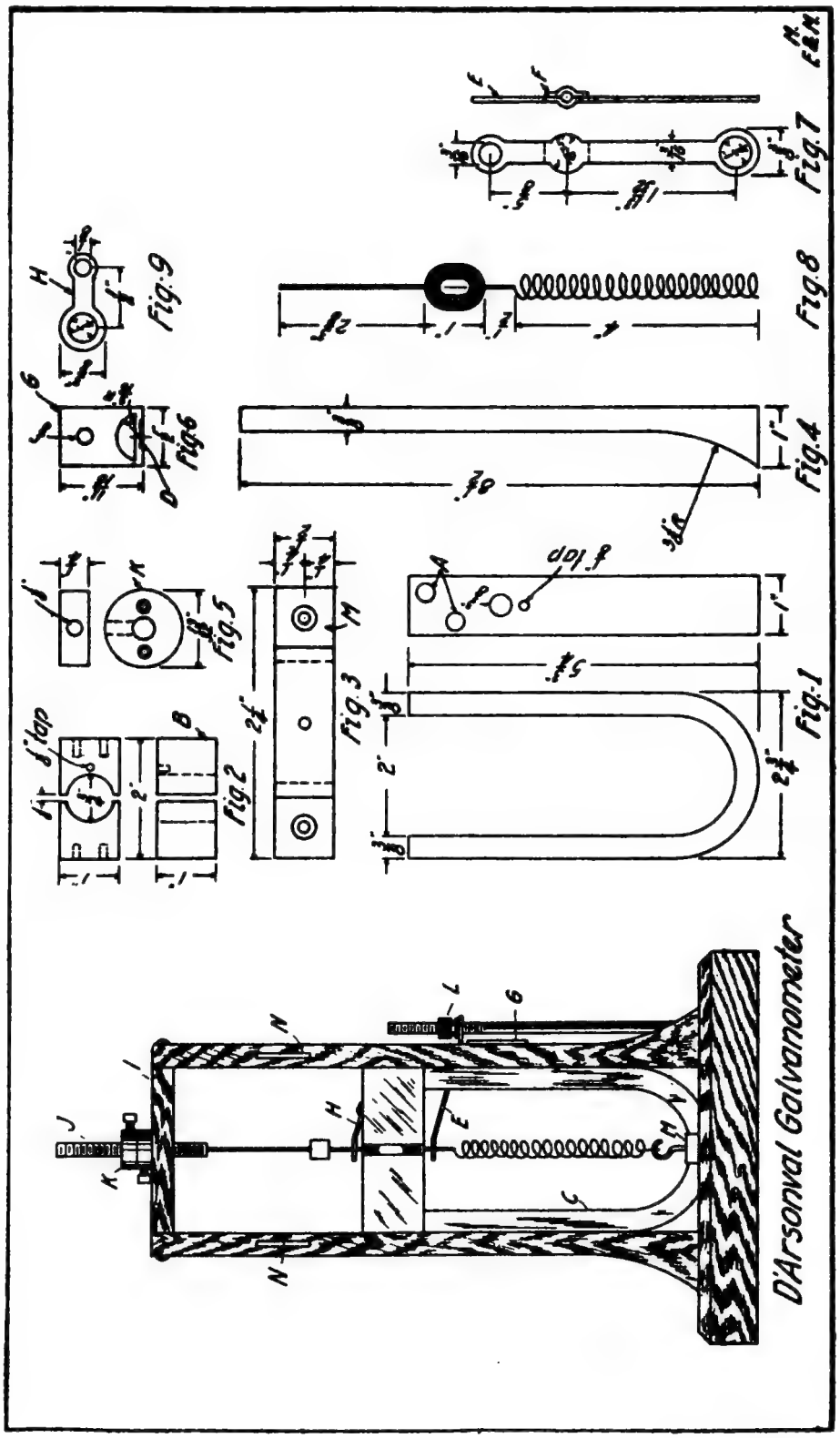


Fig.1
Fig.2
Fig.3
Fig.4
Fig.5
Fig.6
Fig.7
Fig.8
Fig.9
D'Arsonval Galvanometer

Google

Two pieces are then made from brass, as shown in Fig. 5. The wood screw holes may be omitted from one of these. The other is fastened with screws centrally over the hole in piece I.

A piece of brass rod, J, 3/16 inch in diameter and 2½ inches long, with a 1/32-inch hole, ⅛-inch deep, drilled in one end, is now passed through the pieces K and fastened, as shown, with ⅛-inch thumb screws. This supports the moving system.

The moving system consists of a coil of No. 40 B. & S. S. C. C. wire, and is shown in Fig. 8. It is wound over a core of wood ⅛x½ inch. The coil is wound about ⅞ inch long and about ¾ inch thick in the middle and tapers down at both ends. The more turns of wire on this coil as well as the stronger the magnet, the more sensitive the instrument will be. The core is then removed and the coil pressed together until it has a diameter of about ⅝ inch in order to swing freely between the poles of the magnet. When winding, be sure to leave ends about 12 inches long. From one of these, brought out at the top of the coil, the moving system is suspended, and the other is wound in the form of a spring ¼ inch outside diameter and 3 inches long, forming a connecting wire. Now starting ½ inch from the coil on the upper wire and proceeding very carefully, tap it with a light hammer until it is flattened to form a ribbon for a distance of 2½ inches. It is the torsional elasticity of this ribbon which returns the moving system after a deflection. The end wound as a spring is now passed through the ¼-inch hole in E and soldered to hook on it. Then piece H is passed over the ribbon and secured in place with a ⅛-inch screw, as shown. The end of ribbon is then fastened with solder in hole in J.

A small piece of mirror, about 5/16 inch square and 1/16 inch thick, is now secured to the ribbon ½ inch above the coil with sealing wax.

Two long right angle screw hooks are now screwed into the uprights 5¾ inches from the bottom. These are shown at N and should project 3½ inches or 4 inches from the uprights.

The scale, which these hooks support, is made of heavy paper 1 inch wide with 12 divisions reading both ways from center and having the numerals printed backwards.

A wire should now be run from piece K down the upright, through the base to the free binding post.

On the right side a 3/16-inch bolt, 6 inches long, should be run up through the hole in piece E. A thumb nut is then screwed on it, as shown at L and is used to free or tighten the moving system through lever E.

Two pieces of glass 8½x2¾x⅛ inches may be obtained and clamped to the front and back of the instrument, between the uprights, with small wood screws and brass washers.

This completes the instrument. If it has been carefully made it should detect the current generated by placing two pins in a drop of salt water. The deflection of the moving system is seen by looking in the mirror, when at rest, where the reflection of the scale may be seen. When not in use the thumb nut L should be tightened, clamping the coil between E and H.

Contributed by *M. F. Van Orsdale.*

SECOND PRIZE

A NEW FORM OF SECONDARY BATTERY

The writer in the course of his experiments has had considerable success with a novel form of secondary battery that is shown in the accompanying illustrations.

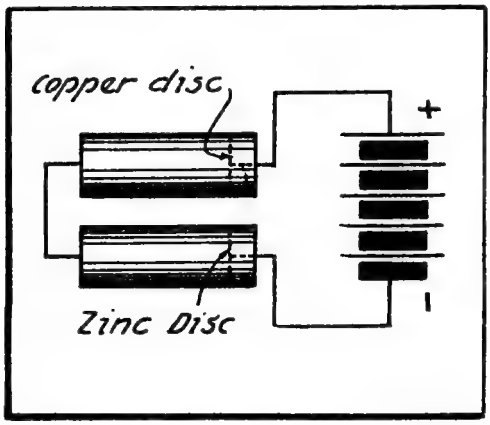
The battery is made as follows:

Procure as many straight lamp chimneys as may be necessary; one chimney being required for each cell of the battery. It is also necessary to procure for each cell four pieces of battery carbon, three discs of zinc and three of copper.

Prepare a paste of one part of sulphuric acid, five parts of sal-ammoniac and twenty parts of water, adding fine coke dust to thicken the paste. Then begin to assemble the cell in the lamp chimneys, as shown in the drawings. The four pieces of carbon rod are first placed in the center of the chimney and one-half inch of paste is packed in on both sides. By following the diagram it will be noted where the copper and zinc discs are to be placed. The drawing must be

Google

followed very carefully if successful results are to be obtained. Brass strips should be used to make connection between the two end discs and the connecting posts. After the cell has been completely assembled, paraffine is poured in both ends, after which sealing wax is used to finish the cell.



In the other diagram is shown a method of charging this form of secondary battery from a group of primary cells.

Contributed by
Millard F. Padgett, Jr.

The type of secondary battery described above is unusual and certainly deserves consideration on the part of readers who are desirous of experimenting with new cells. The author has given only general directions and has left the details to the judgment of the builder.—*The Editor.*

In after years a barefaced lie grows whiskers and becomes a tradition.

THIRD PRIZE

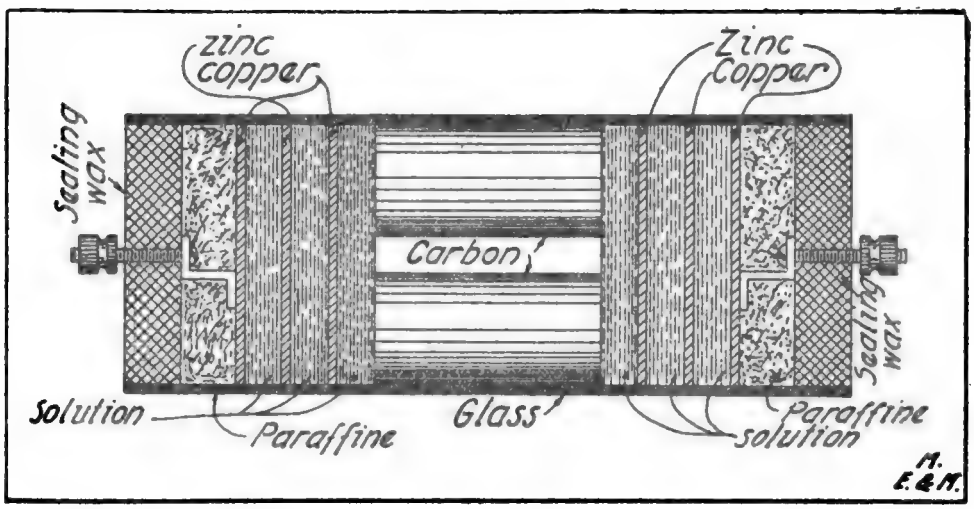
AN ELECTRIC WORM DIGGER

We have electric heaters, stoves, toasters and numerous handy things for almost everybody except the angler, so why not a worm digger?

While wiring a wireless station in Portland, Oregon, last spring, I did some experimenting with the grounded A. C. power system in use there.

By putting the ungrounded line wire in series with a 16 c. p., 110 v. lamp and the ground you will obtain a light of about one-half the normal candle power, and by putting your ground rod in a space clear of grass you will soon find that a whole tribe of worms will come swarming to the surface of the ground within a radius of a foot and a half of the ground rod. By leaving the lamp out of the circuit you will increase the speed with which the worms appear and also the number of worms which are caught, but the meter will go backwards about forty miles an hour and the power company will make things hot for you if they find you at it.

Contributed by *R. N.*



WIRELESS SIGNALS FROM WATER FAUCET

The phenomenon described below is certainly peculiar and I submit it for explanation to the readers.

One evening while sitting in the kitchen I noted a series of hissing sounds proceeding from the water faucet, which

Google

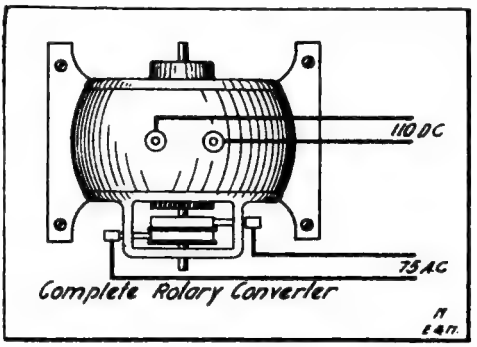
I soon recognized as signals in the continental telegraph code. Upon investigation, I found that these signals could be made very distinct by proper adjustment of the tap handle. The water pressure here is over 170 lbs., and when the faucet valve is almost, but not quite, entirely turned off a slight hiss is produced. The wireless signals manifested themselves by a considerable intensification of this sound, which was so pronounced as to be noticeable at a distance of 10 feet.

I have since noted this phenomenon almost nightly at about the hour of 10. The production of the hissing note appears to be dependent upon a high water pressure, as the manifestation ceased when the mains were partially closed a short time before.

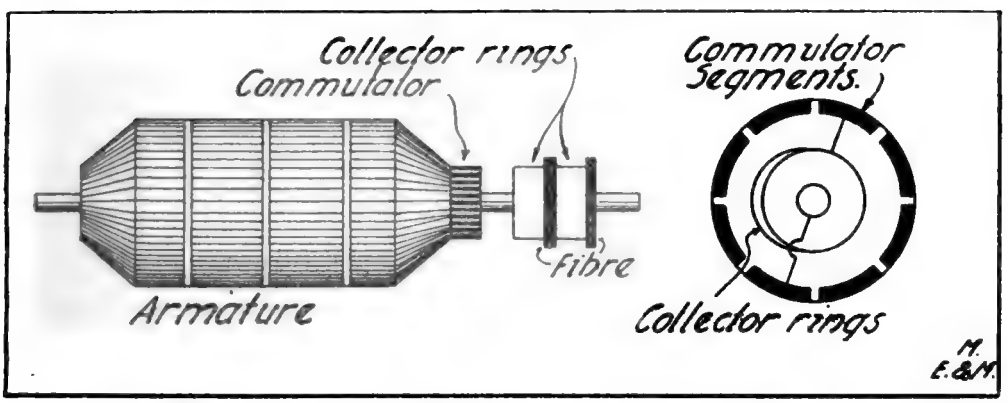
Perhaps some readers with more time and means at their disposal may be able to duplicate this phenomenon and determine its cause. However, any hypothesis on the subject would be interesting.

Contributed by *Oliver O. Frantz.*

The amateur can learn from the illustrations how the converter is made by adding a few parts to the motor, but I will describe the construction so as to make it clearer.



The only materials needed are a fibre rod and two brass rings which may be cut from brass tubing. Drill a hole in the fibre rod the same size as the shaft, then fit the fibre rod over same. Next,



MAKING A ROTARY CONVERTER FROM A MOTOR

Any amateur can make a rotary converter from a motor and use it for practical purposes. If the motor is over ¼-H.P. it should be shunt or compound wound to secure the best results. The writer constructed a rotary converter from a ½-H.P. shunt wound motor and used it for laboratory experiments, also for wireless purposes.

The frequency can be figured by the formula:

$$\text{frequency} = \frac{\text{RPM} \times \text{number of poles}}{60}$$

A frequency under 60 cycles would be impractical for wireless purposes.

cut two brass rings and place them snugly over the fibre rod, leaving a space between the rings of about ⅛-inch; bore a hole in the fibre rod under the first ring and solder a wire to one of the segments on the commutator and run through the hole in the fibre rod to the collector ring on the outside. Directly opposite the connection on the commutator solder another wire and run this to the nearest ring and solder. The armature is then ready to be put back into place in the motor. Fit the collector ring brushes on the motor, making sure that they are insulated from the frame.

Now start up the motor and you can get alternating current from the brushes on the collector rings. If you put in

Google

110 volts D.C. you can figure on getting about 75 volts A.C.

Contributed by *H. B. Pearson.*

USING SPARK COILS ON LIGHTING CIRCUITS.

In the March, 1913, number of *Modern Electrics* a way was described by Mr. H. C. Hunter for working coils on 110 volts. The construction of the arc being rather difficult and the working of it uncertain, I modified the device to suit my own purpose.

The arc herein described and illustrated is like a quenched gap. The two discs are each six inches in diameter and the grooves two inches from the edge.

The arc may be struck in two ways. First, if the discs are made from hard, thin copper, they may be made to touch by a thumb screw pressing on one plate as illustrated in Figure 1. Then again, if the copper is too thick to permit of bending, by boring a hole in the center of one of the discs and by means of a pipette to place a drop of water in the opening, the arc can be started. Then close it by means of the thumb screw as in Figure 2. The joint should be made airtight.

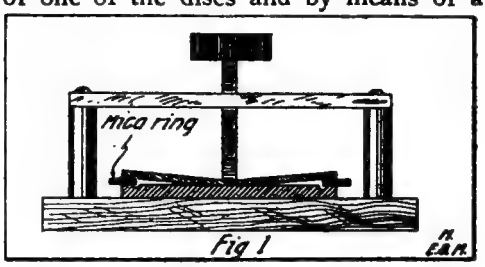
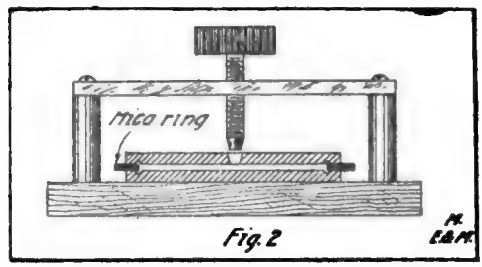


Figure 3 shows the hook-up which is less complicated than the original. Very good results may be had with this arrangement and as the law limits the power that may be employed, it would be advisable for some of the experimenters to try it.

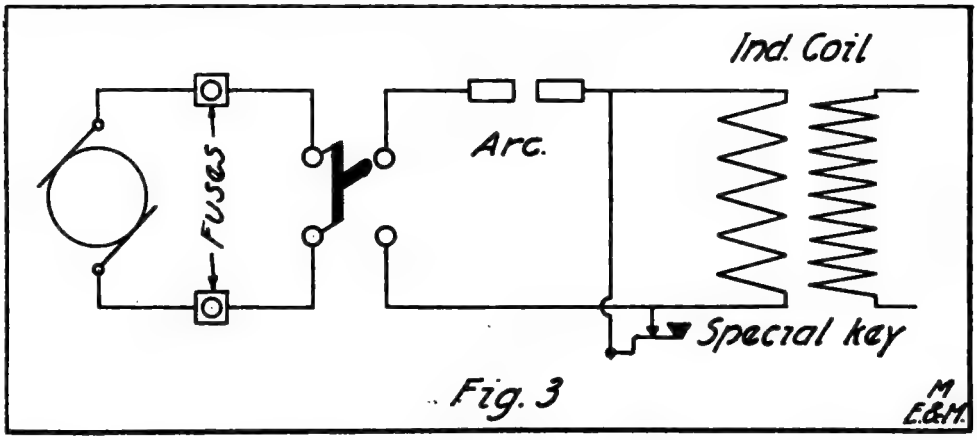


Contributed by *A. R. Radom.*

A CONDENSER STUNT

When making tin foil condensers and soldering the ends to the wires or terminals, most all experimenters know that the tin foil melts very readily. I found by accident that this can be overcome very easily by placing a piece of sheet copper 1-32 inch thick by 6 inches wide and 10 inches long under the foil to be soldered. This prevents the foil from melting because it takes up the heat. This method always worked very nicely with me and a neater piece of work is obtained.

Contributed by *Jas. F. Lupton, Jr.*



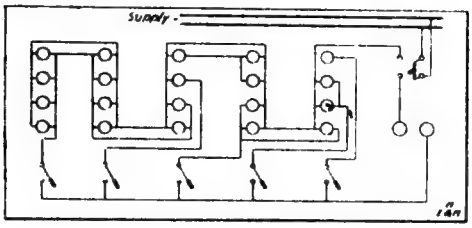
AN IMPROVED LAMP BANK

By following the accompanying diagram the average experimenter can construct a very handy lamp bank.

A clear board, large enough to accommodate the twenty lamp sockets and five switches, is procured and painted. The sockets are fastened in the order shown and wired up to the switches.

Google

Mount the board on a wall near a table and connect to electric light mains through switch. By closing the proper switches from ½ to 10 amperes may be drawn in steps of ½ ampere.



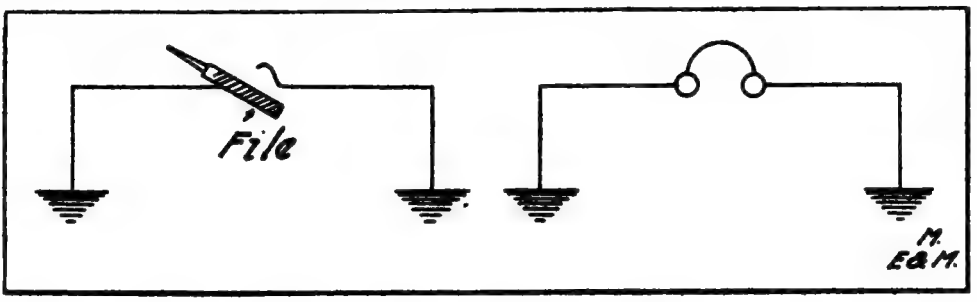
The cleanliness and simplicity of this method of control will appeal to anyone who uses a water resistance at present.

Contributed by *N. Richard Lusse.*

A SIMPLE EXPERIMENT WITH EARTH CURRENTS

This simple and interesting experiment serves to show in some ways the nature and manner in which earth currents are conducted. Place two wires 20 feet or more in length end to end. Ground the ends of each wire. In one circuit place a pair of receivers, in the other place some interrupting device such as a file and needle, as shown in the sketch. When the needle is scratched along the file it can be heard in the receivers. The distance between the wires may be increased to approximately twice their length. The experiment works best in a northeast to southwest direction as this is the general direction of most of the earth currents.

Contributed by *Page Haselton.*



There are sixteen maples in the United States, most of them being eastern species. The most valuable, not only because of the product of its sap but also for its lumber, is sugar maple.

AN AUTOMATIC ELECTRIC LIGHT SWITCH

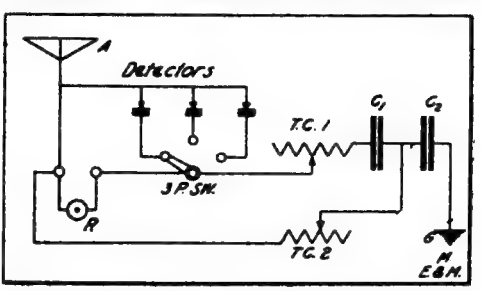
It is a hard, cold proposition getting up these chilly mornings at 5 or 6 a. m., and while yet half asleep, look around for the switch to turn on the electric lights.

I have devised the following scheme: Run an uninsulated wire from one end of the bed to the other. Make the wire one of the contacts of a circuit and the bed spring the other. The weight of the body in the bed will bring these two contacts together thereby forming a circuit. The circuit consists of a relay which has the points reversed, a gravity cell and the necessary wiring. The other posts of the relay are connected to the electric light wires that would ordinarily go to switch. When the weight of the body is removed from the bed, the relay opens and the lights are instantly turned on, thus rendering the entire action of turning on the lights automatic. Care should be taken to see that the bed spring is insulated from the wire.

Contributed by *Irving Vermilya.*

A NOVEL HOOK-UP

I have been troubled with static for some time. I have tried various hook-ups to prevent it and at last I have found the right one. This hook-up is also very good for close tuning. For this hook-up I use two fixed condensers in series.



Contributed by *Gale L. Moore.*

Google

Practical Hints

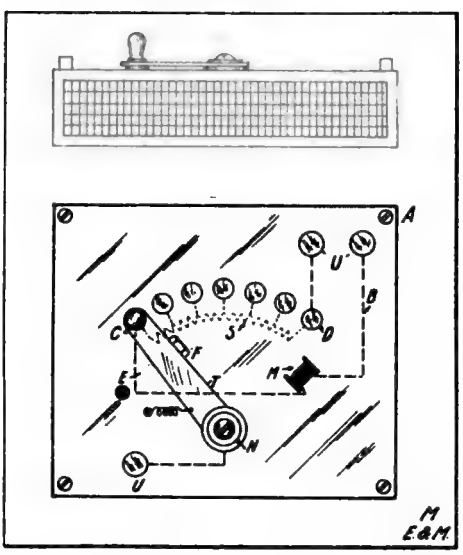
This department is devoted to contributions that deal with new tools, machinery, methods of simplifying different tasks and other similar subjects of interest to the electrician and mechanic in particular, and everyone in general. Contributions to this department should not exceed 200 words. A rough sketch is desirous in instances where the idea will be rendered more comprehensible by its use. All contributions will be paid for at regular space rates on publication.

A STARTING BOX WITH NO VOLTAGE RELEASE

Having a ½-horsepower motor and no starting box I made one as follows:

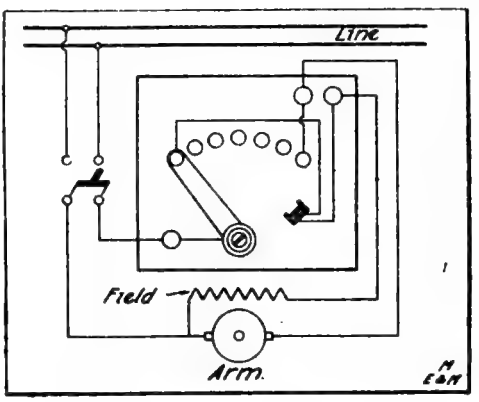
MATERIAL.

Hardwood box 10x10x4 inches.
Seven heavy switch points—D.
One brass strip, 6x½x¼, for arm—T.
A soft iron block to be fastened to arm at point it touches magnet—F.
A magnet with soft iron ends attached to core—M.
A bolt over which a piece of soft rubber tube has been slipped to act as stop—E.
A strong spring to return arm—O.
Any number of shade springs (in my case one dozen were used)—S.
Four binding posts—U.



Two dozen screw eyes to hold springs in box.

The top of the box is drilled as shown in diagram and the parts assembled. The arm T is fastened in place by means of a bolt and should be insulated by



means of a fibre washer as should be the switch points. The magnet is fastened to the box by means of an iron strap which is bolted to the box. The magnet should be placed so it can come in contact with the soft iron block which is soldered to the arm. The spring S is fastened to the arm and the box so it will return the arm when there is no voltage. The stop E is inserted in the cover so as to stop the arm when it returns. The screw eyes are then fastened to the ends, on the inside of the box. The shade springs are fastened on these, care being taken that no two touch. They are then connected in series, taps being taken from every other joint to one of the switch points. The connections are then made as shown by the dotted lines. The connections with motor are shown in the diagram. To start motor, advance arm one point at a time until the last is reached where the magnet will hold the arm unless the circuit is broken. This box will prevent

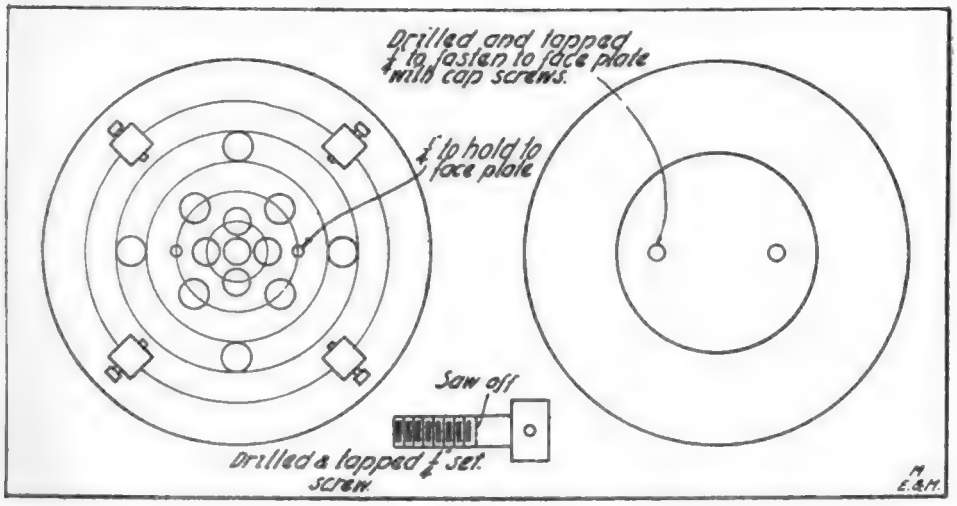
Google

the motor from running away with its load and thereby burning out the windings, and will prevent any damage to it. A circuit breaker can be used in series with it. This box may also be used as an ordinary rheostat.

Contributed by *Wm. Rademacher.*

AN ODD JOB CHUCK

The following is a description of an odd job chuck which can be easily and cheaply made and which will most likely appeal to a great number of readers who run lathes. I had a circular disc cast ½-inch thick and 4 inches in diameter, which I turned up and recessed to fit the face plate, by first drilling two holes and tapping for ¼-inch cap screws and fastening to face plate. After having performed this operation I reversed it



and turned off face and sides and scribed circles ¼ inch apart on face. This, I think, greatly facilitates centering pieces to be held. I then drilled sixteen ⅜-inch holes through chuck (see diagram) for studs. These I made from ⅜-inch square head cap screws, having drilled and tapped head at right angles to shank for ¼-inch set screws (cap screws should be sufficiently long to have shank blank to thickness of chuck plate as the threaded section must be sawed off).

This chuck will hold almost any shape by simply placing studs in holes nearest work to be held and tightening up set screws, care should be taken with finished work, by placing bits of sheet copper or other metal between work and set screws so as not to mar it.

Contributed by *F. A. Berger.*

ELIMINATION OF EDDY CURRENTS IN TRANSFORMERS

The principal objection to closed core transformers is the losses caused by stray currents, commonly called eddy currents. To overcome this, the writer employs a method used by all the standard motor manufacturers in the making of disc punchings for armatures.

The method is as follows:

Soak all parts of transformer iron or core in acetic acid or good strong vinegar until it is all evenly coated by the liquid. Then allow the parts to dry for forty-eight hours and they will be found to be rusted. The rust serves as an insulator.

Some experimenters have used varnish, but the objection to that method is that the core heats up and the varnish begins to melt, emitting a disagreeable odor.

This method may be used with the best of results and very little eddy currents will be noticeable.

Contributed by

Herman Lubinsky.

IMPROVING THE PHONOGRAPH

The appearance of decided tonal imperfections in a phonograph that has been in use for some time may often be traced to the reproducer. This part of the instrument is usually regarded with unnecessary awe, as it is quite simple and may often be repaired by the amateur in such manner as to considerably improve

Google

its operation. Upon dissecting this device it will be found that the diaphragm is held in place by means of two rubber gaskets, which in time lose their resiliency. However, the old rings may still be used if coated to a depth of about 1-64-inch with rubber tire cement. In replacing them care should be exercised not to spread any of the cement across the diaphragm.

A second source of imperfect reproduction may lie in the records themselves. These often become worn just enough to produce an unpleasant harshness, but not sufficiently to destroy their usefulness. Such a condition may be detected by a slight discoloration along the bottom of the spiral groove. The composition of which records are made is soluble in kerosene, and by placing the disc in a pan of this oil for about 15 seconds and allowing it to dry thoroughly, the slight roughness which was the cause of the harsh note may be glazed over.

Contributed by *E. J. Badman, Jr.*

A SOFT NOSED HAMMER

A soft-nosed hammer for finished work can be made in the following manner, at almost no expense:

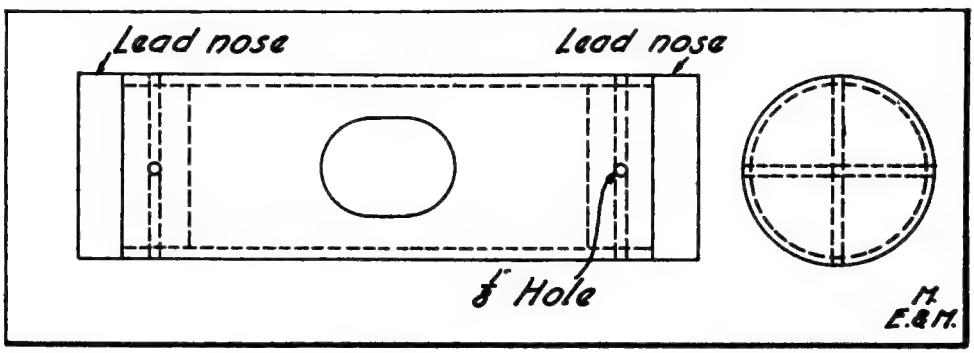
Take a piece of ⅜-inch iron pipe, 2 inches long, and drill ½-inch hole through the center and file it oblong in shape so as to take a handle. Then drill four holes, ⅛ inch in diameter, through the pipe, ¼ inch from each end, these holes being intended to act as locks for noses of lead.

Plug the hole for the handle with clay to prevent lead from filling. Then wrap a number of thicknesses of heavy paper around the pipe, permitting the paper to project about ¼ inch beyond the ends of the pipe. Now melt lead and fill each end to height of paper mould. Allow one end to set before turning over pipe to fill the other end and do not get lead too hot. Have the lead sufficiently heated to run. When finished, trim off ends with an old file, knock clay from the handle hole and fit a suitable wooden handle. When the lead ends become too battered up, melt out the lead and repeat. Thus, this hammer can be readily renovated whenever desired.

Contributed by *F. A. Berger.*

TO REMOVE THE EMULSION FROM PHOTOGRAPHIC PLATES

Old photographic plates can be put to a great many uses when the emulsion has been taken off. The glass is usually of good quality and free from bubbles. Due to the quality of the glass, it is especially adapted for use as a dielectric for condensers and for picture frame glass. In order to clean the emulsion off from photographic plates several methods have been devised, most of which take the larger portion of the emulsion off and leave the plate sticky and dirty. If the plates are placed in a solution of hydrofluoric acid (5 drops to 4 ounces of water) and allowed to stand for five minutes, the emulsion can be pushed off with the fingers and the plate will be left nice and clean.



Contributed by *Davis H. Tuck.*

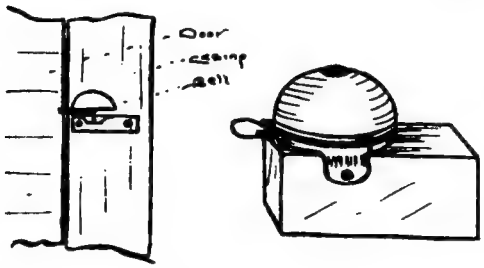
DOOR, WINDOW AND DRAWER ALARM

An ordinary bicycle bell, two wood screws, and a small block of wood, are all the materials required to make a good burglar alarm.

Google

Unlike many alarms this one will ring with the opening or closing of a door.

It is to be attached to door casing so that when the door is moved it presses against the thumb-trigger which is allowed to project in the manner shown in the accompanying sketch. In the case



of drawers and windows, it is only necessary to alter the position of bell.

Contributed by *B. W. Verne.*

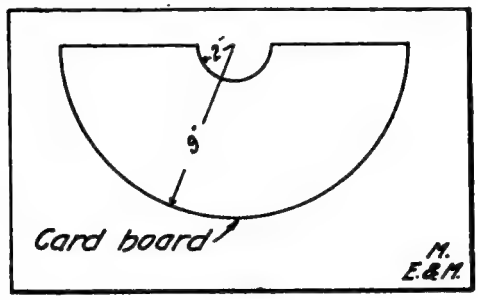
A SIMPLE FUSE BLOCK.

The accompanying illustrations represent the construction of a simple fuse block. The advantage of this block lies in the use of fuse wire instead of fuses, the former being much cheaper. The wire can easily be inserted into the block by pressing down the spring clip and slipping it through the eye screws.

Contributed by *Lawrence Dennison.*

A SIMPLE ELECTRIC LAMP SHADE

A very good lamp shade for an electric drop light can be made at practically no cost by following these directions. Of course, the dimensions can be changed, but those mentioned work very nicely. Take a piece of white or green cardboard (if green is used the inside should be covered with white paper) and make a half circle with a 9-inch radius. Make another half circle of 2-

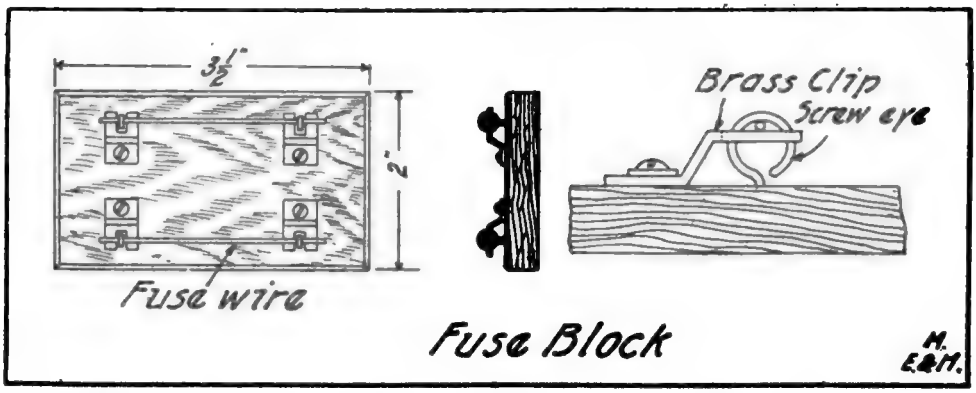


inch radius, using the same center, and cut out. After that is finished, make a cone-shaped object of it with the edges overlapping about ½ inch. These should be fastened (split pin paper fasteners work well) and the shade is finished.

Contributed by *Jas. F. Lupton, Jr.*

WIRELESS HINTS TO SECURE HIGHEST EFFICIENCY

Run your rotary gap slow and it will radiate more into the aerial with less imput in transformer.



Use as short lengths of wire and as heavy as possible, in connecting your sending instruments. It will make a great difference in radiation. Also do the same with receiving sets as it helps some.

—

Have as few instruments in a circuit or set as possible and learn to work them.

—

Don't use porcelain insulators on your aerial if you have a set of ¼ kw. or

Google

over. If too expensive to insulate entirely with electrose, use one 10½ inch heavy electrose insulator between spreader and rope.

—

Don't try new connections on your receiving set every day. Get a standard hookup and learn to tune with it.

—

Use low voltage secondary side transformers, for then you only need small condenser capacity, which will balance up with your aerial of 200 meters.

Contributed by

Derek Breitenbach.

HOME-MADE PINCH DOGS

Pinch dogs are quite necessary articles to have on the shop work bench.

Various sizes can be easily and quickly made by securing a short length of chan-

nel iron of a desired size, then, with the aid of a hack-saw, cut as shown in the illustration, file points, and the pinch dog is finished.

Contributed by *Bert W. Verne.*

THE EDISON EFFECT IN WIRELESS TELEGRAPHY

(*Continued from page 288*)

maximum ionization were present. In the oscillation valve, maximum ionization is present if the valve is constructed, as it should be, to produce a maximum Edison effect.

Thus, we can see that if a valve is properly made, the presence of a magnetic field will enhance its sensitiveness, while if defectively constructed, its action will be retarded when subjected to such a field.

It has been noted by users of audions, that if the voltage across the wing and the grid were increased much above 30 volts, a blue light formed in the lamp and the valve was not so responsive to feeble signals, yet greatly increased the intensity of strong or local signals. This may be explained as follows: When the blue light appears, the current is well up on the flat part of the curve. This was noted several times in obtaining the data for this paper. Obviously, we cannot be making use of the non-linear characteristics of the saturation curve of the valve here, since the part of the curve on which we are now operating the audion, instead of being steep is quite flat. The evident conclusion is that the rectifying properties of the valve are now being brought into play, and we can readily see how it would not be as sensitive for feeble signals as the critically delicate method of operation used in the other means. On the other hand, if we had a very strong incoming signal when operating on the latter method, the limit of the intensity of the sound in the telephone receiver would be represented by or be a function of the length of the steep portion of the curve. On the contrary, if we were operating on the flat part of the curve utilizing the rectifying properties of the valve, the only limit to the intensity of the signal in the receiver would be the magnitude of the incoming oscillations.

The presence of the magnetic field will invariably aid in the reception of signals by this method, since when receiving local signals, it may be used to concentrate the cathode rays into the space between the wing and the grid, thus increasing the conductivity of the gas and aiding the rectifying process, or when attempting to read feeble signals, it may be directed on the electrons so as to drive them out of this space, thus forcing the current back on the steep portion of the curve, extinguishing the blue light and returning to the other method of using the audion.

From a commercial standpoint, it is interesting to note that the Audion and the Fleming valve are the most sensitive receptors for radio-telegraphic signals that can be practically installed, yet due to the slight expense involved for the renewal of valves and the delicacy of their successful operation, they have not come into very wide adoption.

Google

High Frequency Current Apparatus

A Series of Articles Covering the Theory, Making and Operation of High Frequency, X-Ray and Ozone Apparatus

By Frank Brewster

EDITOR'S NOTE:—This is the second instalment of the series on the construction and operation of X-Ray, High Frequency and Ozone equipments. The first instalment appeared in the February issue.

CHAPTER II—THE INDUCTION COIL (Continued).

THERE are numerous ways in which to operate the 12-inch spark coil for X-ray duty. The simplest one is that involving the use of a vibrator or interrupter actuated by the magnetic impulses occurring in the iron core of the coil itself, which are due to the making and breaking of the primary circuit.

A sketch of a vibrator of this type and designed for this coil when used on battery power, is shown in Fig. 6. It is so proportioned that it will have a long make or closing period and a sudden quick break or opening period; this fea-

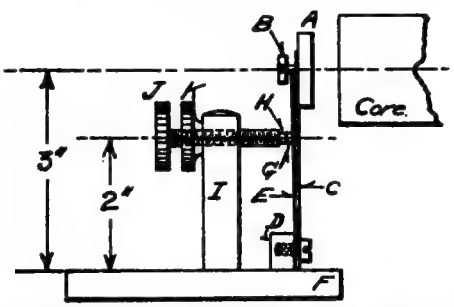


FIG. 6.—VIBRATOR INTERRUPTER FOR USE WITH INDUCTION COIL WHEN OPERATING ON BATTERY POWER

ture being essential to the production of a lively spark with no appreciable lag, which is an inherent property of all common single spring vibrators or rheotomes.

In the drawing, A is a soft iron armature or hammer ⅛-inch thick and 1¼ inches in diameter. B is a flat-head machine screw threaded into the centre of the armature and acting as a limit stop for the play of the contact spring E, so it will not be drawn away from the contact point H, until the armature spring C has attained a good start in its motion toward the core, thus allowing the magnetism in the core to reach its maximum value before breaking the circuit. The armature spring C is of clock spring steel 1-inch wide and 1-32-inch thick, secured to a brass support D about ½-inch high.

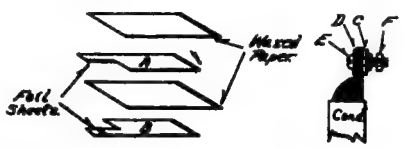


FIG. 7.—METHOD OF ASSEMBLING THE CONDENSER

E is the contact spring and is held on the same support as the armature spring, but is free to move by itself above the support. Two inches from the lower end of this spring is fastened the platinum contact point or rivet G, opposite the platinum point H, on the adjustable contact screw J. This screw is threaded through the upright column I, and carries the check nut K to lock it in any desired position. The platinum points

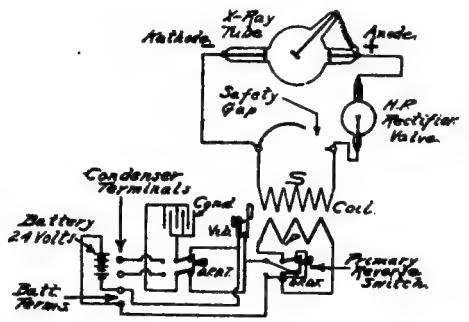


FIG. 8.—WIRING DIAGRAM FOR CONNECTING THE VARIOUS PARTS OF THE INDUCTION COIL

should be ⅛-inch in diameter and 3-32-inch long, with their contact faces filed perfectly flat and parallel.

Google

It is a good plan to mount the complete interrupter on a hard rubber or fibre base as at F, so that the distance between the armature and core may be regulated for the best operation, the distance being in most cases from ¼ to ⅜-inch, or just so the armature does not hit the core while vibrating.

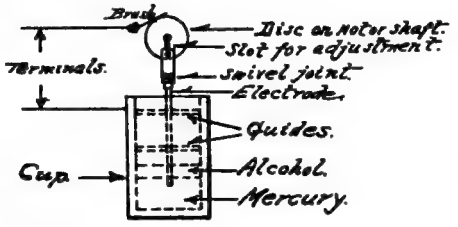


FIG. 9.—A SIMPLE FORM OF MERCURY INTERRUPTER FOR USE WITH INDUCTION COIL

When this form of interrupter is utilized, or any other slow speed make-and-break device, it is necessary to employ a condenser in conjunction with it. One terminal of the condenser is connected to the contact spring base, and the other condenser terminal to the contact screw pillar.

This condenser may be constructed of 5 or 6 mil paraffined paper sheets 1½ inches larger all around than the tin or aluminum foil sheets of which the condenser is built. The amount of active foil area required is 10,000 square inches, which may be divided up into say 168 leaves, each leaf 6 by 10 inches in size, and connecting 84 sheets to either side of the interrupter. The method of assembling the condenser is seen in Fig. 7, where A and B are the alternate foil leaves of the pile, the connecting strips of which are clamped together firmly by the two brass pieces C and D and screw E, the wire connection going under the nut F.

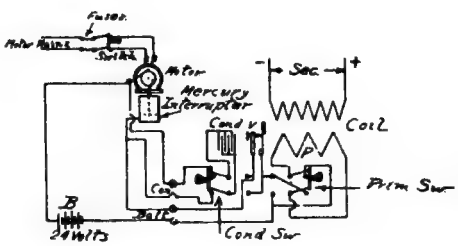


FIG. 10.—CONNECTIONS FOR INDUCTION COIL WHEN USING MERCURY INTERRUPTER

The coil can be operated very well with the parts here described for ordinary work. A diagram of the proper connections of the various parts of the complete coil is given in Fig. 8. The arrangement is for battery power, with switches for reversing the polarity of the primary and consequently the secondary current, and for switching the condenser from the coil interrupter to an independent or outside one when such is used, such as the mercury turbine.

Most every coil builder has ideas of his own in the mounting and finishing of his coil, and so no details will be offered here. A cut of a standard style of mounting a 12-inch spark coil was illustrated in the preceding instalment.

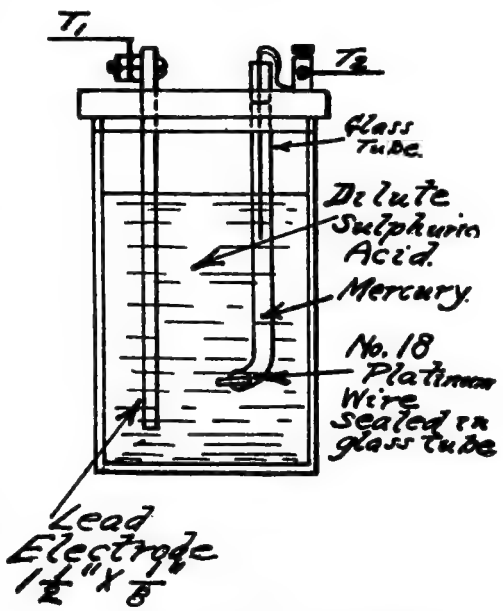


FIG. 11.—A SIMPLE FORM OF WEHNELT INTERRUPTER SHOWING THE ESSENTIAL PARTS

For those desirous of utilizing a mercury interrupter, a plan of the essential parts is shown in Fig. 9, which represents the simplest form of this type of interrupter. The brass or copper electrode is inserted in the mercury pool and removed with considerable rapidity, by means of a disc on a motor shaft, to which the point is attached as shown. The motor speed should be variable and reach a maximum of 2,500 to 3,000 revolutions per minute. As this is a slow speed type of interrupter, the primary coil condenser must be switched across it, a diagram of the proper connections in

Google

this case appearing in Fig. 10. With the employment of such high speed interrupters as the Wehnelt or Caldwell of the electrolytic type, no condenser capacity in the primary circuit is necessary. The Wehnelt interrupter is suited to the operation of induction coils on anything over 40 volts, either alternating or direct current, and is extensively employed for X-ray purposes, the secondary discharge taking the form of a flame instead of a stringy spark.

A Wehnelt interrupter may be constructed similar to the sketch exhibited at Fig. 11, while Fig. 12 shows the scheme followed in the regular commercial product. In the operation of the Wehnelt interrupter, considerable heat is evolved, sometimes causing the electrolyte to boil. To offset this undesirable feature, the best plan is to place a small ⅜-inch lead pipe in the container, the

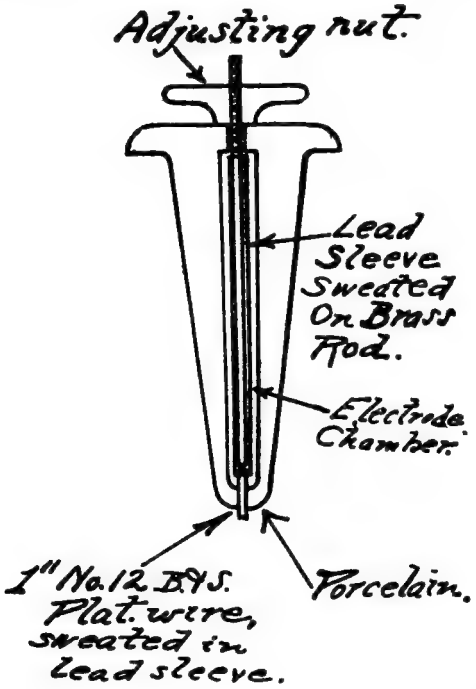


FIG. 12.—CONSTRUCTION DETAILS OF COMMERCIAL ELECTROLYTIC INTERRUPTER

pipe having five or six convolutions through which is circulated cold water. Two pieces of rubber hose attached to the ends of the cooling spiral, serve to conduct the water to and away from it. A cooling spiral is shown in Fig. 13.

If this interrupter is used with the coil, it sometimes happens that the results are not satisfactory. Insufficient primary inductance or "kick current" is the general cause of this trouble, which can be remedied by connecting in series with the primary coil, an extra inductance or choke coil, composed of a soft iron wire

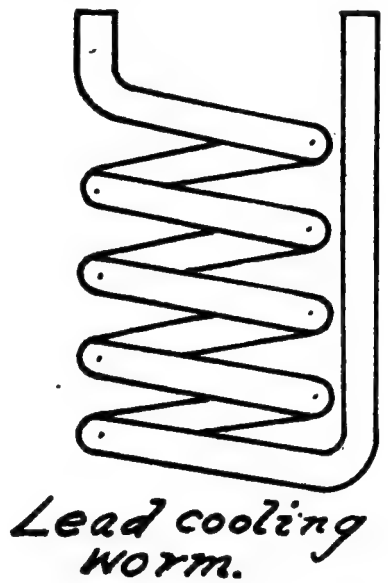


FIG. 13.—COOLING SPIRAL EMPLOYED IN SOME INTERRUPTERS

core 1½ inches in diameter and 12 inches long, over which is wound a coil of six layers of the same wire as on the primary, of course insulating the iron core with several layers of oiled linen or heavy shellacked paper. Taps for varying the amount of inductance are brought out from each layer, and connected to a six-point switch. To further improve the fineness of the inductance variation, the coil may be wound on a thin fibre tube, into which more or less of the iron core may be inserted, the highest inductance obtaining when the core is all the way in the coil, and the entire winding is cut into circuit.

If battery power forms the source of energy for the coil, sufficient cells should be used to furnish 24 volts; connecting the cells in series. The voltage of common dry cells is 1.5; Edison primary cells, .95 volts; storage cells, 2 volts.

For the illumination of the world's largest steamer, the *Imperator*, nearly 10,000 incandescent lamps are required.

Google

Institute of Radio Engineers

AT the regular monthly meeting of the Institute of Radio Engineers, held on January 7, Mr. R. H. Mariott read an extremely interesting and valuable paper upon "Variations in Radio Range." He presented two sets of detailed observations of variations in the range worked through by two stations for the space of a year, one of these being in Denver, Colo., and the other at Manhattan Beach, Coney Island, New York.

In each case curves were plotted showing the variation in range throughout the day, month and year, both in sending and receiving. Some were even shown representing the variation from minute to minute, on a particular day, of the intensity of signals received at a station working with Manhattan Beach, with a constant state of affairs at the transmitting station. Corresponding to the range curves, a number of additional curves were plotted showing factors affecting the condition of the atmosphere at the time. These gave such data as temperature, barometric pressure, vapor pressure, humidity, hours of daylight, intensity of moonlight, and presence of close or distant static discharges. The personal equation was also taken account of, note being made when there was a change in operators, or when much interference did not give the operator a chance to try for long ranges.

The usual known facts that longer ranges were obtained in winter and at night than in summer, and in the day time, were confirmed; but one interesting observation was brought out by the speaker, which seemed to show that throughout the year the range varied directly as the vapor pressure. For this, a number of theories were advanced by the speaker, and also by those taking part in their discussion.

The value of the paper was largely in the mass of details which it furnished, which will probably make it a standard work in radio-engineering. Its delivery was much enlivened by personal episodes indulged in by the speaker in regard to the character of the sets he used (they were of the ordinary spark variety), and the operators who worked them. The paper was discussed by Dr. J. J. Stone, Mr. J. L. Hogan, Dr. De Forest, and Mr. Austen Curtis.

At the same meeting the regular election of officers for the coming year was held, and the following elections were announced:

President: L. W. Austin.
Vice-President: J. J. Stone.
Treasurer: J. S. Hammond.
Secretary: E. J. Simon.
Managers: Messrs. Weagant, Hogan, Hill and Marriott.

OREGON STATE WIRELESS ASSOCIATION

The Oregon State Wireless Association held their regular election of officers December 5, and the following were elected for the coming six months: President, C. L. Austin; vice-president, George Schwartz; secretary, G. E. Spencer, 446 6th street, Portland; treasurer, L. L. Leonard, and Sergeant-at-arms, W. A. McCrum.

This club has an active membership of twenty-five, most of whom own and operate their own stations. Any one owning a station or interested in wireless work in the State of Oregon, is eligible to membership.

Most of the stations of the club members are able to receive from San Diego, Cal., on the south, and Victoria, B. C., on the north, while the better stations have no trouble in hearing Honolulu and the Alaskan Government stations.

The club meets every Friday night in Room 421 of the Y. M. C. A. The members will be pleased to communicate with other clubs and individuals through the secretary.

DANGERS OF GRADE CROSSINGS

According to a record recently issued by the National Highways Protective Society, it appears that during the last year grade crossing accidents caused the death of 124 persons and injury to 140 in New York State. In the State of New Jersey, 54 persons were killed and 48 injured.

Google

Simple Home-Craft Furniture

The Second of a Series of Articles Describing the Making of Various Pieces

By G. Lane

Illustrated from drawings made by the author.

THE piece of furniture chosen for this article is an arm chair, a large comfortable one, and yet simple enough so that it can be made by anyone who has a working knowledge of tools and the requisite skill and patience to make the many joints necessary. The wood most suitable for this chair is, of course, quarter sawed white oak, although plain sawed red oak may be preferred, owing to the fact that it is considerably cheaper and is also easier to work.

The next thing to consider is the bill of lumber, which is given below, combining all the pieces of one width and thickness together.

OAK.

Back posts	1 pc. 2″ x 4″ x 7′.
Front posts	1 pc. 2½″ x 2½″ x 4′, 6″.
Arms, front and back seat rails	1 pc. ⅞″ x 5″ x 10′.
Side seat rails	1 pc. ⅞″ x 3″ x 4′, 6″.
Lower braces	1 pc. ⅞″ x 2″ x 4′, 6″.
Back rails	1 pc. ⅞″ x 6″ x 30″.
Slats	1 pc. ⅞″ x 3″ x 9′.
	1 pc. ⅞″ x 4″ x 24″.

PINE.

Slats for cushion	1 pc. ½″ x 4″ x 6′.
Cleats on seat rails	1 pc. ⅞″ x 1½″ x 4′.

Before beginning work, be sure your smoothing plane and scrapers are in good shape—no one can do good work with dull tools. On ordinary grain, a few very thin shavings with a smoothing plane will take off any planer or sander marks on the wood. First smooth up the 4″ surfaces of the back posts. Then lay out with rule and straight edge the form of the back posts and saw out with rip saw, keeping on the waste side of the line. Smooth up these edges with smoothing plane, using spoke shave and scraper at low point on back of posts. Work both pieces together to insure exactly the same shape, being sure to keep the edges square. Take a very small bevel off from the top ends to keep the corners from being too sharp.

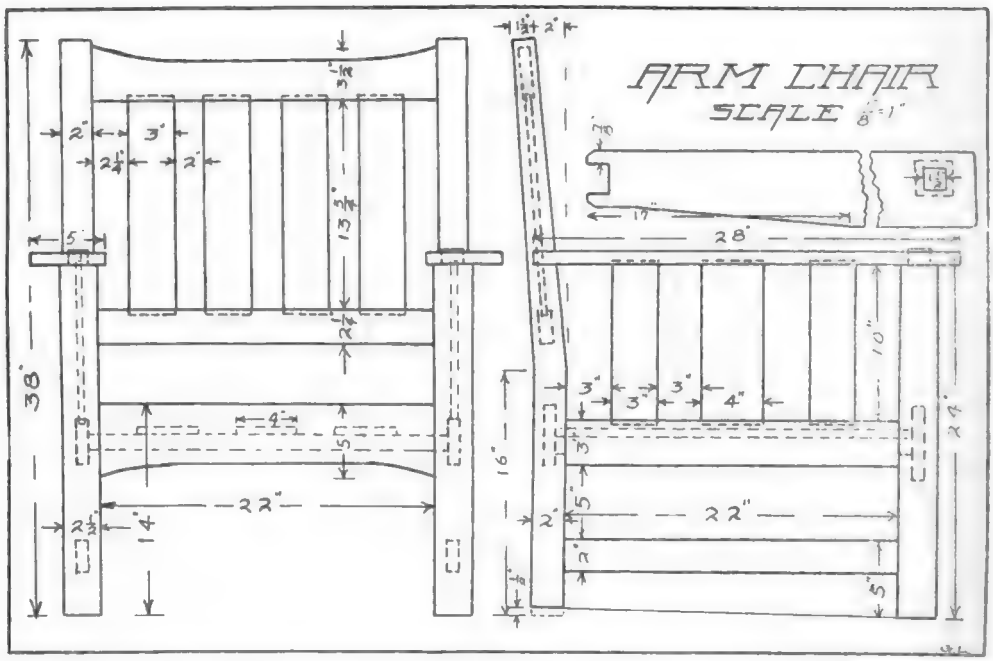
Plane up front posts and saw to proper length in mitre box and smooth up top end. In places where the kind of joint is not shown on drawing, the maker may choose between the mortise and tenon, or the dowelled joint. In the explanation, however, it is assumed that dowelled joints are to be made. In case the mortise and tenon joint is employed, add a proportionate length for the tenons. Remember that the ends of all pieces, in case the dowelled joint is used, must be perfectly square, while the shoulders of the mortise and tenon joints must be square.

Next plane up and cut the 2-inch and 3-inch rails for the sides, then lay out the arms, cutting on waste side of the line with rip saw and smoothing up with scraper and smoothing plane. Round all corners of arms with sandpaper. Smooth up and cut to length the slats for the sides and lay out on under side of arms and top edge of seat rail the mortises to receive the slats. These will not need to be mortised in very deep, ⅛-inch or ¼-inch will do, as there is no strain on these pieces. Lay out joints for rails and posts, using two ⅜-inch dowells, if dowelled joints are to be used, for each joint. Cut mortise in arms and tenon on front posts, allowing the posts to project through the arm about ⅛-inch above the arms, and bevel the end of the tenon back ⅛-inch. Put the posts together with rails, *without glue,* and measure exactly how far back to cut the notch in the end of the arm to receive the back post. Owing to the fact that the back posts slant back a little, the notch will have to be cut a little deeper on the under side of the arm. Now put the entire sides together, making sure that every joint comes together tight. Bore a ⅜-inch hole through arm and post, from inside, taking care not to bore all the way through to the outside. To insure a perfect joint here, it is well to have a clamp to hold the pieces together tight while the hole is

Google

bored. Cut the dowells a little longer than necessary. Also, clamp the arm to the front post and put ⅜-inch dowell through the mortise and tenon joint, from the inside.

Although the sides might be put together with glue now, lay out and make joints on the inside of posts first, as it is much easier to make them while the chair is not yet assembled. So next prepare the front and back seat rails, noting that the back rail should be ½-inch longer than the front, as the back posts are narrower than the front. Get out the back rails, making joints carefully. Lay out on these the mortises to receive the slats, cutting carefully, making them



about ½-inch deep. Smooth up slats and cut to proper length. Put on inside of front and back rails the ⅞ x 1½-inch cleats to hold the slats for cushions, using 1¼-inch flat head screws.

Assemble the chair complete, without glue, making sure that the joints are tight. Now put just the sides together, using hot glue if possible, or the best cold glue obtainable. Have the furniture clamps all adjusted to proper length before applying glue, however, and have plenty of small soft wood blocks to put between the clamps and the chair, to keep from marring the surface of the wood. Glue the joints and clamp together quickly, using three furniture clamps for each side. Test each joint with a square.

After allowing the glue to set for twenty-four hours, remove clamps and scrape off carefully any glue that has been squeezed out of the joints. A good tool to use for this purpose can be made by heating and bending at right angles the end of a flat piece of steel, about ½-inch wide, and grinding an edge on the end. Draw a line with a straight edge from the lower corner of front post to a point ½-inch above the lower corner of the back leg (as shown on drawing). Saw carefully on this line both posts, and bevel slightly the corners. By sawing in this manner we give the chair a slight reclining position.

Now glue the rest of the pieces together, and be sure, before the glue sets, that the chair is not "in wind"; that is, be sure that all four corners touch the floor at the same time. After the glue has set, remove clamps and give chair the final inspection, scraping off any glue that remains, and sandpapering to remove any rough spots. Nail in the three slats to hold the cushion.

The chair is now ready for finishing, and as finishing was discussed at some length in the last article under this title, it will not be necessary to do so here. Remember you cannot get a good finish if your wood is not in proper shape. Apply the stain according to the instruc-

Google

tions, and then the filler, afterwards applying whatever finish may be desired. Be sure to wait long enough between coats.

It is not necessary to make the cushion for the back of the chair, although it would, of course, add to the comfort of the chair. Several materials might be used for the cushion, and if imitation leather is employed, it is better to get the best grade possible. This grade has good wearing qualities and is not as expensive as real leather. A moss for stuffing the cushion may be procured from any upholsterer. If it is not advisable to make the cushion, any upholsterer can be called upon to do so.

In making this chair, it should be remembered that it is not necessary to follow the drawing exactly. If you do not wish to have the two rails curved, simply leave them 5 inches wide; or if you do not wish the chair quite so large, cut down one or two inches from the length of the rails.

ROLLER SKATES IN INDUSTRIAL PURSUITS

Whenever one thinks of roller skates it is invariably in connection with the pleasure that can be derived from them. However, a street railroad company in New Bedford, Mass., has found another use for roller skates.

In the stockroom of this firm are kept numerous articles, ranging from little bolts to heavy pickaxes. The room is over 170 feet in length. When orders are to be filled it is necessary for the clerks to go from one part of the room to another, necessitating the covering of a considerable distance each day. The firm has recently furnished roller skates to the stock clerks, who can now move swiftly and with less exertion to any part of the room. Although many of the boxes are located on high shelves, the ladders are so made that the clerks can climb them readily without removing the skates.

THE WORLD'S BUSIEST THOROUGHFARES

It is gathered from good authority that the two busiest streets in the world are the Mansion House Corner, in London, and the Place de l'Opera in Paris. Although the former has the greatest number of pedestrians, the latter has the larger share of vehicular traffic. Every week-day 500,000 persons walk past the Mansion House, while the number of vehicles is 50,000. Through the Place de l'Opera it is said that 450,000 pedestrians and 63,000 vehicles pass daily.

After these two most important streets, comes Broadway of New York, which is said to be traversed by 480,000 foot passengers daily. In all, over 700,000 pass through on street cars or automobiles. The next in importance is the Puerta del Sol in Madrid, Spain, which is actually the meeting place of several important streets. Over 360,000 people pass through it daily. The three remaining thoroughfares of leading importance are the Friedrichstrasse, Berlin, and the Vladimirski Prospekt, St. Petersburg, with 300,000 each, and the Graben, Vienna, with a daily average of 275,000 persons.

EVAPORATION

The rate at which vapor is formed depends on the temperature. For a given temperature it is not proportional to the area of the surface of the liquid, as ordinarily supposed, but to the linear dimensions of the surface; and in an open vessel evaporation takes place more rapidly near the boundaries of the surface than at the center. The rate of evaporation is thus not the same at all parts of the surface. This question has been examined theoretically by Stefan,* and he finds that for a circular vessel the quantity of vapor formed per second is proportional to the diameter, and further, that the lines of flow of the vapor from the surface are hyperbolas, of which the foci are on the bounding edge of the circular surface. The surfaces of equal pressure are the orthogonal system of ellipsoids; these are nearer each other at the edge of the surface than at the center, consequently near the edge of the vessel the vapor pressure decreases most rapidly, and it is here, therefore, that the flow is greatest.

The question has also been examined experimentally by Winkelmann,† and although he was unable to verify Stefan's theory very closely, he attributes the discrepancies rather to the mode of experiment than to any defect in the theory.
—*Jeffrey B. Macphail.*

* Stefan, Journal de Phys., 2 serie, tom. i., 1882.
† Wied. Ann., vols. xxxiii., xxxv., 1888.

Google

THE EDITOR'S DESK

Another month has gone by and here we are again with a big, full-of-interest issue; one that contains a mass of information of all kinds. In this number all of the serial articles appear—an instalment of the article on small alternating current motors which covers the working directions for making one; the second article on the making of furniture, which deals with the construction of a comfortable and attractive arm chair; the second chapter on the construction of high frequency, X-ray and ozone apparatus, giving the remaining details regarding the making of an induction coil; and the conclusion of the article on modern industrial and military explosives. There are numerous interesting articles in this issue that deserve passing comment, among them the splendid article on the Edison effect in wireless telegraphy which represents extensive experimenting along original lines by its author. The leading article of this issue describes recent experiments with the divining rod—a topic that has been the subject of much derision in the past, due to the lack of proper investigation as to its merits. The article describing the construction of a marble inkstand should appeal to those readers who are handy with tools and desire to make attractive ornamental articles in marble and metal. It is our intention to publish more material along this line in the future. Space forbids the mention of the many other articles that possess perhaps equally commendable features.

We are again shocked by another tragedy at sea in the recent collision between the *Monroe* and the *Nantucket*, in which numerous lives were lost. Not the least important incident of the catastrophe was the bravery displayed by Ferdinand Kuehn, the wireless operator, who lost his life while aiding a woman passenger. Kuehn was a New York boy who lived in the Bronx with his mother and secured his early training in wireless with home-made apparatus. The experience he thus gained enabled him to secure a position with the Marconi Company about three years ago. In the beginning he was assigned to one of the Long Island Sound boats of the Joy Line, plying between New York and Boston. Later, he was transferred to the *Jefferson* of the Old Dominion Line. Over a month ago this vessel was laid up for repairs and Kuehn was then appointed operator on the *Monroe*. When the tragedy occurred, Kuehn was making his second trip on that vessel. According to reports, it appears that after the two vessels collided, Kuehn immediately began to call aid by wireless, but the apparatus soon became inoperative, due to the flooding of the engine room below. Seeing that it was useless to remain longer at his instruments, he placed a life preserver around himself and proceeded to aid passengers. He was last seen tearing off his life belt and placing it around a hysterical woman who had not taken any precautions to provide herself with one—thereby deliberately sacrificing his life by this unselfish action. There are many brave wireless operators who have sacrificed their lives in executing their duties, but none deserves greater veneration than twenty-year-old Ferdinand Kuehn. May his brave act always be an inspiration to others.

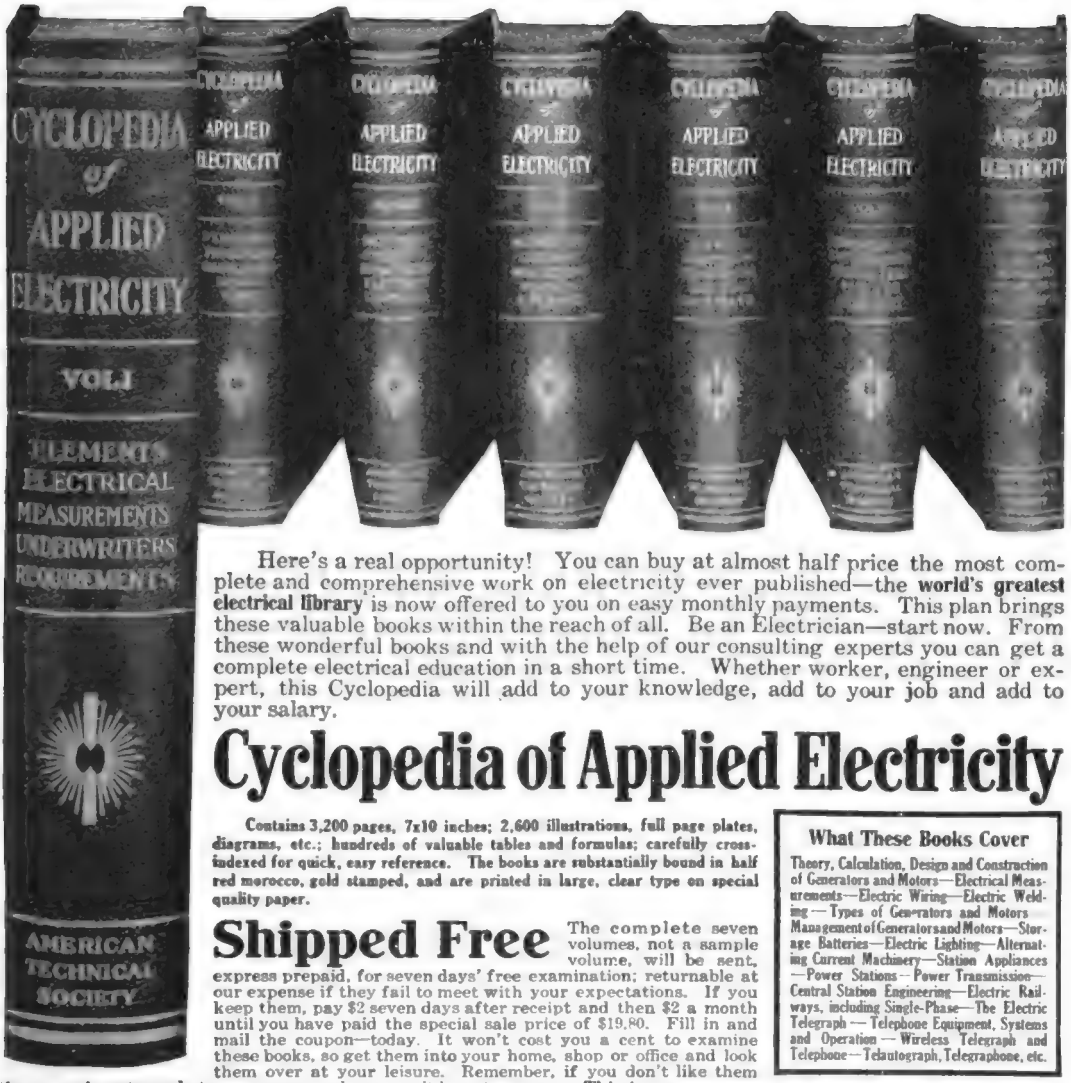
Ferdinand Kuehn, the wireless operator who lost his life on the steamer *Monroe* of the Old Dominion line, attended The Paine Uptown Business School from August 15, 1910, to January 11, 1911, in order to qualify in wireless operating.

The aim of MODERN ELECTRICS AND MECHANICS is a two-fold one. Every reader knows that our main endeavor is to provide carefully selected articles each month on the topics of electricity, mechanics and wireless. That is evident. But every reader does not know that we are also endeavoring to make MODERN ELECTRICS AND MECHANICS a veritable guide as to where different instruments, supplies, training, services, and other possible requirements can be procured. In every issue will be found the names and offers of various manufacturers, dealers, schools, institutions and others who can best cater to the needs of our readers. In most instances the names represent the leading firms in their particular fields. Readers need not hesitate in entering into relations with any of these advertisers since everyone is known to be reliable and the advertisements to be truthful.

There are many good things in store for the readers of MODERN ELECTRICS AND MECHANICS. For one thing, there will shortly be a new series of articles on pattern making—a trade that is most interesting and highly paid. This series will cover all the details concerning pattern making and will give every reader of this magazine a good foundation in the subject. Another excellent article is a short history of the steam locomotive, accompanied by many unusual illustrations depicting the early days of railroading, when horse cars were employed, up till the present-day huge passenger and freight locomotives. Most of the illustrations in this article have never appeared in any other magazine circulated in America. But we have not told you all! There are articles on cable telegraphy, new phases of wireless telegraphy, electro-chemistry, and many others, too numerous to permit of mentioning.

Google

YOURS FOR $2 a month. This $35 set now only $19.80



Here's a real opportunity! You can buy at almost half price the most complete and comprehensive work on electricity ever published—the **world's greatest electrical library** is now offered to you on easy monthly payments. This plan brings these valuable books within the reach of all. Be an Electrician—start now. From these wonderful books and with the help of our consulting experts you can get a complete electrical education in a short time. Whether worker, engineer or expert, this Cyclopedia will add to your knowledge, add to your job and add to your salary.

Cyclopedia of Applied Electricity

Contains 3,200 pages, 7x10 inches; 2,600 illustrations, full page plates, diagrams, etc.; hundreds of valuable tables and formulas; carefully cross-indexed for quick, easy reference. The books are substantially bound in half red morocco, gold stamped, and are printed in large, clear type on special quality paper.

What These Books Cover

Theory, Calculation, Design and Construction of Generators and Motors—Electrical Measurements—Electric Wiring—Electric Welding—Types of Generators and Motors—Management of Generators and Motors—Storage Batteries—Electric Lighting—Alternating Current Machinery—Station Appliances—Power Stations—Power Transmission—Central Station Engineering—Electric Railways, including Single-Phase—The Electric Telegraph—Telephone Equipment, Systems and Operation—Wireless Telegraph and Telephone—Telautograph, Telegraphone, etc.

Shipped Free

The complete seven volumes, not a sample volume, will be sent, express prepaid, for seven days' free examination; returnable at our expense if they fail to meet with your expectations. If you keep them, pay $2 seven days after receipt and then $2 a month until you have paid the special sale price of $19.80. Fill in and mail the coupon—today. It won't cost you a cent to examine these books, so get them into your home, shop or office and look them over at your leisure. Remember, if you don't like them they may be returned at our expense and you won't be out a penny. This is one of the most liberal offers ever made. You can't afford to pass it by.

Consulting Service Free

With every set is included absolutely free a year's Consulting Membership, regular value $12, entitling you to the advice of a staff of electrical experts. These men are no farther from you than your nearest mail box. They stand ready to solve your perplexing problems, to offer suggestions, to point out the things you should avoid. Absolutely no limit to their assistance—ask as many questions as you wish for a whole year. This service alone will be worth more to you than the entire cost of the books.

Don't wait. This means $15.20 saved if you act now. Remember, you take no chances whatever—it costs nothing to inspect and you are nothing out if you do not care to buy. This offer may mean your success, so mail the coupon today—**now**—before you turn the page.

American Technical Society, Chicago, U. S. A.

FREE COUPON
Worth $15.20 to you

American Technical Society
Chicago, U. S. A.

Please send me Cyclopedia of Applied Electricity for seven days' free examination. If I keep the books, will send $2 within seven days and $2 a month until $19.80 has been paid, when $35 books and $12 consulting membership will be mine. Otherwise will notify you and hold books subject to your order. Title not to pass until fully paid.

M.E.&M. 3-14

NAME .....

ADDRESS .....

As I have had no previous dealings with you, I refer you to

.....

Google

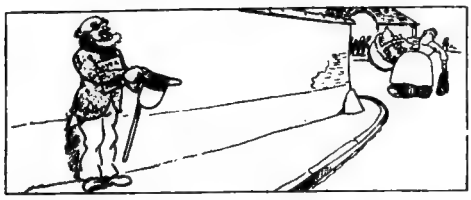
FLYING SPARKS

HE PREFERRED GUESSING

A traveling man was stopping at a small hotel that was recognized for its bad catering. A waiter presently asked him: "Will you have tea or coffee, sir?"

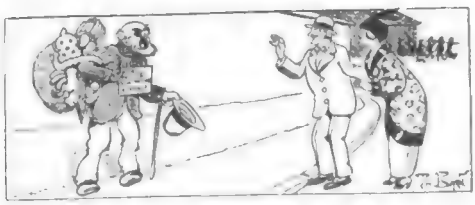
"Don't tell me which it is," replied the traveler, "Just bring it in to me and let me guess."

THE OBLIGING BEGGAR



Beggar—"Have pity on a poor blind man who has nothing to eat."

She—"Tell me, my good man, will you hold my basket, which is very heavy, while I go to the store."



Beggar—"Have pity on a poor blind man, who has nothing to eat."—*Le Pele Mele.*

SOME CHASER!

The fat drummer who wanted the 12.20 train passed through the gate at just 12.21. The ensuing handicap was watched with absorbed interest both from the train and the station platform. At its conclusion the breathless and perspiring knight of the road wearily took the back trail, and a "red cap" came out to relieve him of his grip.

"Mister," he inquired, "was you tryin' to ketch that Pennsylvania train?"

"No, my son," replied the patient man. "No; I was merely chasing it out of the yard."—*The Railroad and Current Mechanics.*

HE HAD ONE ALREADY

Salesman (stepping into the office of a prospective buyer): "I am introducing a brand new and wonderful invention—a combined talking machine, carpet sweeper and letter opener."

Prospective Buyer (very busy with numerous pressing details): "Got one already—I'm married."

NOT COLOR BLIND

A young mother, who had just returned from India, engaged a new nurse for her baby. The nurse came to her and said

"I don't know what's the matter, madam, but the little one cries and cries. I can do nothing to quieten it."

The mother thought a moment; then, brightening up, she said:

"I remember now. Baby's last nurse was a black one. You will find the stove polish on the third shelf in the kitchen."—*Tit-Bits.*

HE KNEW WHAT WAS COMING

Sandy was being entertained at a Soho restaurant, London, and the dinner consisted of rich and fanciful dishes.

"Well," he was asked, "what will you have next?"

"Ah!" replied Sandy, thoughtfully. "I think I'll hev indigestion!"—*Tit-Bits.*

Google

CONSTRUCTION OF SMALL ALTERNATING CURRENT MOTORS

(*Continued from page* 316)

top of the frame, two others, over one of which the connection board may be placed, are near the bottom, while further communication with outside air can be provided by letting the machine stand on strips whereby the bottom openings are free. Additional ventilation holes may well be drilled through the internal flange, and for still better circulation of air, when circumstances require or permit, modification in the frame or end castings can be made as shown in a later figure.

If the builder demurs at the making of such a difficult pattern, he may be satisfied with a simpler construction, involving two identical castings that are merely rings, between which the sheet iron can be clamped. Such rings should have an outside diameter of about 8½", and the bolts so spaced as exactly to press against the sheet iron. Two projections can be cast on the flanges to provide bolt holes for securing the stator on a base. This latter part can be made to imitate direct current construction, having a large central seat and two smaller end ones that can be bored out to a diameter of 7¼". Into the central seat, with suitable portions removed to make room for bottom bolts, the stator can be secured, and into the end ones the bearings, the bottoms of which have been turned off to the same radius as the sheet iron. Such a construction will give acceptable alignment, accessibility and certainly good ventilation. Convenience of winding, too, is assured, for that interesting part of the making can be done while the stator is removed from the base.

If the builder is provided with a casting as shown in Fig. 7, his first step will be to bore out the interior seat for the sheet iron. This may tax the capacity of his lathe. If, however, a stiff lathe of not less than 14" swing over the bed is available, he may accomplish the task by bolting the casting to the face plate. He will thereby avoid the necessity of making a special boring tool with traveling head, as may otherwise be necessary,

Here's Your Opportunity!

Twenty million moving picture "fans" attend thirty thousand moving picture theaters in the United States every day. Thousands of moving picture plays are bought each year by the producers to supply the enormous demand—in fact—THERE ARE MORE MOVING PICTURE PLAYS BOUGHT EACH MONTH THAN THERE ARE STORIES BY ALL THE HIGH-CLASS MAGAZINES IN THE UNITED STATES COMBINED. Producers are paying $15.00 to $100.00 for motion picture plays, and carry standing advertisements in the magazines inviting writers to submit their work.

People in all walks of life, clerks, teachers, stenographers, students, housewives — are making money in their spare time at this work. Lack of literary training is no handicap. There are no descriptions or conversation to supply — just IDEAS — developed into plays under the simple rules required by the producers.

You Can Succeed In This Work

Your ideas are worth money

You have had ideas that you thought would make good Moving Picture plays — better than some you have seen on the screen. If you haven't, suppose you give the matter a little thought. Go to the theater tonight. Note how simple the stories—yet these simple little plays brought their writers $25.00, $50.00 or $100.00 each.

Literary Training Not Necessary

If you are possessed of imagination — and who is not?— if you are ambitious and can use more money than you are making now — if you have tried to become a story writer and failed because of insufficient literary training — THE MOTION PICTURE PLAY OFFERS A SHORT CUT TO SUCCESS. Think of seeing YOUR OWN IDEAS on the screen in your own town, before your friends. This is to experience a satisfaction that cannot be described.

Let Us Teach You To Turn Your Ideas Into Dollars

You can make $50.00 to $100.00 a month in your spare time. Others are doing it! You have the ideas. Let us teach you how to use them in this new and profitable work. Our simple and interesting Course will teach you everything you need to succeed — how to write and how to SELL your plays. Our Course has been prepared by a WRITER OF NATIONAL REPUTATION. You probably have enjoyed many of his plays on the screen. He will give you his PERSONAL HELP AND ADVICE throughout the Course. He will teach you his methods, by which he SUCCEEDED.

Send For Our Catalogue

There is MONEY and FAME to be gained in this new profession, if you start NOW! We have prepared an interesting Catalogue, which tells all about the wonderful possibilities of this work and describes our easy and fascinating method of teaching. Suppose we send you a copy? It is FREE. Simply sign the coupon and sent it in TODAY.

Authors' Motion Picture School, Dept. J
122 So. Michigan Ave.
Chicago, Ill.

AUTHORS' MOTION PICTURE SCHOOL, Dept. J
122 So. Michigan Ave., Chicago, Ill.

I am interested in learning how to write MOTION PICTURE PLAYS. Please send me catalogue and particulars regarding your method of teaching.

Name .....

Address .....

Digitized by Google

ELECTRICAL BOOKS

Electricity Simplified

By T. O'Conor Sloane. The object of "Electricity Simplified" is to make the subject as plain as possible, and to show what the modern conception of electricity is: to show how two plates of different metals immersed in acid can send a message around the globe; to explain how a bundle of copper wire rotated by a steam engine can be the agent in lighting our streets; to tell what the volt, ohm, and ampere are, and what high and low tension mean; and to answer the questions that perpetually arise in the mind in this age of electricity. 158 pages. Price, $1.00.

How to Become a Successful Electrician

By T. O'Conor Sloane. Every young man who wishes to become a successful electrician should read this book. It tells in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 202 pages. Price, $1.00.

Standard Electrical Dictionary

By T. O'Conor Sloane. A practical handbook of reference, containing definitions of about 5,000 distinct words, terms, and phrases. 632 pages. 393 illustrations. Price, $3.00.

Wiring a House

By H. Pratt. Shows every step in the wiring of a modern house and explains everything so as to be readily understood. Directions apply equally to a shop. Price, 25 cents.

Electric Toy Making, Dynamo Building and Electric Motor Construction

By T. O'Conor Sloane. This work treats of the making at home of electrical toys, electrical apparatus, motors, dynamos, and instruments in general, and is designed to bring within the reach of young and old the manufacture of genuine and useful electrical appliances. 140 pages. Price, $1.00.

Arithmetic of Electricity

By T. O'Conor Sloane. A practical treatise on electrical calculations of all kinds reduced to a series of rules, all of the simplest forms, and involving only ordinary arithmetic; each rule illustrated by one or more practical problems, with detailed solution of each one. 133 pages. Price, $1.00.

Telephone Construction, Installation, Wiring Operation and Maintenance

By Radcliffe and Cushing. A practical reference book and guide for telephone wiremen and contractors. Every phase of telephone wiring and installation commonly used to-day is treated in a practical, graphic and concise manner. Intricate mathematics are avoided, and all apparatus, circuits and systems are thoroughly described. The appendix contains definitions of units and terms used in the text. Selected wiring tables, which are very helpful, are also included. 175 pages fully illustrated. Price, $1.00.

Commutator Construction

By Wm. Baxter. The business end of a dynamo or motor is the commutator, and this is what is apt to give trouble. This shows how they are made, why they get out of whack and what to do to put 'em right again. Price, 25 cents.

MODERN PUBLISHING CO.
231 FULTON ST. NEW YORK

When writing, please mention "M. E. and M."

and to the somewhat springy casting he will add the stiffness of the face plate itself. A specially stiff boring tool is desirable, and this can well be extemporized by putting a cutter into the end of a bar that will fill the tool-post slot. For convenience in bolting the casting against the face plate, it may be advisable to leave a projection at the top extending out as far as the overreach of the feet; three points of support will thereby be provided, and by a little filing or shimming, the piece may be readily centered.

The seat on the four ledges should be bored to 7¼", to fit the sheet iron, one of the sheets itself rather than the rule being used for measuring. There will be small need of turning off the inner face of the flange against which the sheets are to rest. If the builder wishes, he may next turn off the outer rim over which one of the bearings is to fit, but as the other rim must be machined by some other means, he may as well postpone this item until ready to do both.

If a large lathe is available and the face-plate method is not desired, the frame casting may be bolted directly onto the regular carriage, and with a simple boring bar between the centers, the cutting may be readily, though slowly accomplished. There will be solidity in taking the chips on the bottom and side ledges, but at the top some springiness will be experienced, whereby the size of chip will be limited. If conditions require a third method of boring, namely, by bolting the casting directly to the bed of the lathe, the case will be quite like that of boring an engine cylinder, the head of the boring tool making a slow advance at every revolution. If special cutters are then provided, the lips at both ends may then be cut, and if all this turning is accomplished at one setting, certainly an accurate alignment may be expected.

When the outer edges for supporting the bearings are to be turned at a separate operation, the casting must be mounted on a suitable arbor, and such a fixture can readily be provided by utilizing a pulley. Let the central hole be made as large as convenient, and a true arbor inserted. Rim of pulley should have about a 4" face, and while on its own arbor be turned to fit the 7¼" space in the frame casting. To drive the lat-

Google

ter during the process of turning off the edges, it is well not to depend upon the "dog," but to insert a stiff bolt in the face plate that can directly push against some portion of the rim. The distance between the faced edges is to be made 5", but at this particular stage of the work, the diameters may well be left a little large, say 8¼" rather than the specified 8 3/16", whereby if a mistake is made in turning the end castings an opportunity will be reserved for correction.

Considerable drilling may next be done,—the hole for the eye-bolt at the top, four for the base bolts, two for the connection board, and those for ventilation. The four on each rim cannot as yet be located, for they are to be marked off from the holes as drilled in the end castings. Similarily, the eight holes for bolts that clamp the sheet iron can best be marked off from the drilling in the companion piece.

3.—END-SHIELD AND BEARING

Two identical castings of dimensions as shown in Fig. 9 are required, and they can well be as thin as stove iron. Fig. 10 gives the perspective view of a casting. The central portion, or hub, contains the oil reservoir and the housing for the removable bronze bushings or linings in which the shaft revolves. The castings are centered in a chuck or on a face-plate and the central holes bored and reamed to ⅞". A regular arbor that is reliably true, or one that has been specially turned for the purpose, should then be fitted to the hole and the rim turned to the dimensions shown, or until a satisfactory fit is made with the frame. This fit is an important one, and should be made with considerable care. While it is not essential that these two end castings be interchangeable with each other, there is no objection to machining them quite alike. The outer rim of contact will be sufficient, the inner surfaces being separated by as much as a sixteenth of an inch, as seen by inspection of Fig. 2. If it is of any consequence to be able to operate the motor, instead of in its usual position, on wall or ceiling, the location of these end shields must be interchangeable in a rotational sense, for certainly the oil reservoirs must always be at the bottom. To provide for this case, the four holes must be

We teach you Electricity by giving you the actual work to do.

You Learn By Doing!

You learn, not from books, but through personal inspection and actual handling of all tools, material and machinery used in the electrical profession today. Our system of teaching is distinctly our own and used by no other school of its **kind.**

Our course is an engineering course simplified, yet containing all the elements necessary to the student's success. It eliminates the frills and spectacular demonstrations that serve to amuse but do not instruct. It aims to make the student a working power rather than a store-house of theory which he cannot apply.

From the day of entrance to the day of graduation a student in our school is an individual, not a member of a class, of a section or division. He enters when he is ready to start and he stays in the school until he is actually qualified to hold a position in any of the many lines of the electrical profession.

Visit our school, if possible, and see our students at work or write for free booklet describing our course and system of instruction.

The New York Electrical School

26 W. 17th Street
New York City

When writing, please mention "M. E. and M."

Google

BE A TRAVELING SALESMAN

Earn $1000 to $5000 a Year

You can learn to be a salesman in eight weeks by mail and be earning while you are learning. No former experience required. Write today for particulars, large list of good openings and testimonials from hundreds of our students now earning $100 to $500 a month. Address nearest office.

Dept. 127 National Salesmen's Training Association
Chicago New York Kansas City San Francisco

Take Your E's

ENGINEERING EDUCATION EXTENSION

by an entirely new method, with a minimum of mental exertion, in the shortest time at the least expense, FITS ANY MAN regardless of age FOR A PROFESSIONAL CAREER.
Young men should fit themselves during their spare moments for the profession of

Electrical Efficiency Engineer

Again note the ease: E. E. E.

Our courses are being pursued by High School students who thereby command good wages upon graduation. They are also being pursued by central station operatives and others who are looking for better positions and salary.
The field of Efficiency Engineering is a new one.
BE THE FIRST TO PREPARE. For full particulars address:—

Engineering Education Extension

LOCK BOX 41 HANOVER, N. H

Learn Piano 4 Times Faster

Obtain free booklet explaining how the QUINN WRITTEN METHOD with Dr. Quinn's patented device, the COLOROTONE, revolutionizes the teaching of music, and saves three-quarters of the time, effort, and cost usually considered necessary to learn piano, organ, and singing. Discard old-fashioned methods, and investigate this simple, yet scientific method, endorsed by leading musicians, which teaches you right in your own home, to play chords immediately and to play complete pieces, at sight, in the first three lessons. Special $60 tuition credit, given away, if your name reaches us soon enough.

MARCUS LUCIUS QUINN
CONSERVATORY OF MUSIC
1626 N. Harding Ave. Dept. M. E. M. Chicago, Ill.

MUSIC TAUGHT FREE at your home

By the Oldest and Most Reliable School of Music in America—Established 1895

Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc.

Beginners or advanced players. One lesson weekly. Illustrations make everything plain. Only expense about 2c. per day to cover cost of postage and music used. Write for FREE booklet which explains everything in full.
AMERICAN SCHOOL OF MUSIC, 51 Lakeside Bldg., Chicago

CIVIL SERVICE

positions are very desirable. Good salary, short hours, easy work, pleasant surroundings, life positions, steady work, thirty days vacation and thirty days sick leave annually with pay. 46,202 appointments made last year. No political pull needed. Common school education sufficient. Must be 18 years or over. Full information about how to secure these positions and questions used by the Civil Service Commission free.

COLUMBIAN CORRESPONDENCE COLLEGE, WASHINGTON, D. C

MECHANICS AND HANDY MEN
BUILD YOUR OWN 2 H.P. WATER COOL GASOLINE ENGINE
OTHERS HAVE BUILT THEM. WHY NOT YOU?
WE SELL COMPLETE SETS OF ROUGH OR MACHINE CASTINGS
SEND 6c. FOR PHOTOS, PLAN POINT AND CATALOGUE
VIGNEAU MANUFACTURING CO.
BIDDLE BLDG. DETROIT, MICHIGAN

exactly spaced. While the casting is still on its arbor, a thread tool can be used to mark on the outside of the four bosses scratches that will diametrically measure 7¾" apart. Lightly locate a prick-punch mark in the center of one of these bosses, then with compasses space the other three. When assured of the correct locations, they may all be deeply prick-punched. The holes can then be drilled and counterbored to fit the fillister headed screws that are to be used.

One of the shields can now be slipped onto the frame, and the ¼" drill run into the latter for a short distance. Now remove the shield, run in a No. 7 drill for at least half an inch further and tap it No. 14-20. Replace the shield, mark the other three holes, remove the cover, drill and tap as before. Similarly the other cover may be accurately located. A hole is to be drilled and tapped for securing the oil-well cover, but this should not be done until marked off from the brass casting itself, as shown in a later drawing. The two drip holes can, of course, be now drilled, also the one for the set-screw that fastens the lining in place.

NO NEED TO WORRY

The late Thomas B. Jeffrey, who built bicycles and automobiles, was a man of few words. One day he was on a railroad train when a traveling acquaintance called his attention to a big building in a town by which the train was passing.

"See that warehouse?" asked the traveler. "Well, ten years ago I could have bought that whole thing for seven thousand dollars, and now it's worth twenty."

"Did you have the seven thousand?"

"Oh, no."

"Well, then," said Jeffrey, "I wouldn't let it worry me."—*Chicago Ledger.*

THE LAW OF CHANCE

May Kissam—"I'm afraid papa would make a scene if he came home and found you here."

Jack Willing—"I just left him at the club; he won't be home very early."

May Kissam—"How do you know?"

Jack Willing—"He was two hundred in the hole when I left."—*Puck.*

Digitized by Google

Popular Educational Food Campaign

Eggs in wrong combination and an excess of starchy (paste making) and fatty foods make people sluggish and cause dull, splitting headaches, lack of memory and concentration, drowsiness and inertia. A complete change to "digestible" brainy foods (suitable meat, game, fish and suitable dairy foods, combined with suitable vegetables and fruits according to the new brainy food plan) produces the most marked improvements in a few weeks.

G. H. BRINKLER
Food Expert

Brainy Diet

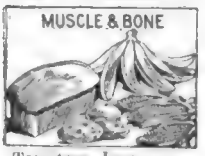
A thin man, after being out of work nearly a year through weakness, was restored in three weeks to hard work as a carpenter at full pay. In such cases the change from wrong combinations of foods, an excess of starchy, cloggy, death producing foods to energizing foods causes a literal transformation.

Another person, deaf in the right ear, owing to a discharge caused by an excess of mucus making foods (cream, butter, cheese, etc.) completely eliminated the catarrh thereby restoring his hearing by taking correct combinations of suitable foods.

A case of kidney and bladder trouble of ten years' standing was saved from a surgical operation, and the objectionable discharge relieved within ten days, because the loss of control was due entirely to the constant irritation from certain irritating foods and drinks.

Prurigo or "Itch," chronic, beyond the remedies of doctors and skin specialists completely disappeared within three months.

A chronic sufferer, weighing 415 pounds, unable to exercise, reduced over 150 pounds (in public life, under many witnesses), gained strength and firmer flesh, and lost rheumatism.



Tomatoes, Lemons, some fruits are solvents; Green Vegetables are laxatives; etc.

Over 100 similar cases certified by Official Investigating Committee

During nineteen years of personal experiments, I have learned to produce in myself **rheumatism, catarrh, sore throat, tonsilitis, constipation, double chin, swollen glands, kidney troubles, shortness of breath, rough scaly skin, dandruff, sores, boils, pimples with white pus, blackheads, rash, and other symptoms at will** by eating of different classes of foods in excess for several days or weeks according to the symptoms desired. AND I CAN RESTORE MYSELF TO GOOD HEALTH IN A FEW DAYS BY CORRECT DIET. The foods which cause expectoration, catarrh, cough, constipation, tumors, etc., are specified in my booklet which has taught many to cure themselves.

"The New Brainy Diet System" sent for 10 cents. Send Addresses of Sick Friends to

G. H. BRINKLER, Food Expert, Dept. 5C, Washington, D. C.

One Day's Pay One Man's Work $28.50 With This

made by Jos. Hancock, Lamoni, Iowa. Schearer, Montana, made *$22.35 in 5 hours.* Miller, Iowa, Made $13.65 in one afternoon. *We have proof* of this and hundreds of similar reports. No matter who you are or where you live, here's your chance to double your present salary or income, working during spare time or permanently as a *one minute photographer. No experience needed.* A new, live business of big cash profits. You can work at home or travel, enjoy the healthful, outdoor work and become independent in your own business. Invest one cent for a postal—ask us for proof of what others are doing—of what you can earn with a

Mandel Post Card Machine

A portable post card gallery. Takes, finishes and delivers photo post cards and buttons in a minute's time—makes five different styles of pictures in 3 sizes. **No plates, films or darkroom.** One minute pictures sell like wildfire. Everybody buys. Picnics, fairs, carnivals, busy corners, small towns and large cities—**Big Money Everywhere.**

This Picture-Taking Outfit

gives you a complete, ready made business that produces profits for you at once. You can make 100 to 200 sales a day, easy. Each sale brings 5c to 15c clear profit. Small capital. Sale of first supplies brings back practically your entire investment. Write at once for full particulars FREE.

The Chicago Ferrotype Co.
76 Ferrotype Bldg., Chicago; or Dept. 76 Public Bk. Bldg., New York

Technically Trained Men Needed In Business Departments

Men like yourself who, owing to your mechanical and technical training, are badly needed to sell either by **Advertising** or personal **Salesmanship.** Why—because you can give a more thorough explanation of the mechanical details of electrical mechanical devices—machines, motors, etc.

Now, since you have this great advantage, of knowing the mechanical details—learn how to "commercialize your knowledge; Study Advertising or Salesmanship.

Within a few months after you enroll with this University, you will be ready, thoroughly **capable of** taking any of the numerous positions in the Business Department of the large number of concerns seeking "Technically Men Commercially Trained" to either take charge of the Advertising Departments, Assist or become Sales Correspondent, Copy Writer, Salesman, Traveling Business Promoter, etc. The field is new, large and succeedingly profitable.

SEND FOR BOOKLET TODAY
explaining either our course in Advertising or Salesmanship

North American University

332 Peoples Gas Building, Chicago

Conducting { Chicago College of Advertising. Chicago College of Salesmanship. National Traffic College.

Google

BRONZITE

THE PERMANENT GREEN PAINT

Use **BRONZITE** for all exterior painting because it never fades and wears longer than other Greens.

BRONZITE is impervious to chemical action; atmospheric conditions; resists heat and is non-corrosive.

COLONIAL WORKS

225-237 Norman Ave., Brooklyn, N. Y.

Electric Lighting Outfit

Especially for your bedroom The long wire extended to your bed allows you to press the snip in order to see the time on your clock, which may be placed behind the bulb. Complete with Tungsten Lamp, 25 c. p. reflector, 3 large size batteries and switch for permanent light contact. $1.45. Weight 10 lbs

Send 5c for all literature about Wireless Apparatus, etc

COSMOS ELECTRIC CO., 136-M Liberty St., N. Y.

BIG MAIL FREE

Your NAME PRINTED in our Mailing Directory and sent to firms all over the world so they can send you FREE Samples Catalogs, Books, Papers, Magazines, etc. Send 25c. to cover cost of printing your name and you'll receive a big mail FREE. Proof—

Ingram, Va., Mar 1, 1912. Gentlemen—I have already received 2000 parcels of mail, and still they come, scores of papers, samples, magazines, etc., for which I had often paid 10 to 25c. R. T. James.

Send to BIG MAIL DIRECTORY, 1124 Foster Ave., Chicago

THIS OXYGENATOR BOOKLET FREE

Every sick man and woman in the land should read this great booklet. Costs nothing to get it. It points the way to honest health, true wealth, real happiness. The more you have suffered, the severer your ailment, the more you have "doctored"—the more you need to read this wonderful story about Oxygenator, the most marvelous discovery of the age. No matter what the age, it is to your advantage to read this booklet from cover to cover—whether you have stomach or bowel trouble, rheumatism, liver, kidney or bladder disorder, catarrh, lung or bronchial trouble, blood or nervous disease, ailment or weakness peculiar to men or women, scrofula, Bright's disease, blood poison, appendicitis, or what. It shows how thousands have been cured by this wonderful discovery without medicine or knife, and after all else failed.

WESTERN OXYGENATOR COMPANY
BEATRICE, NEBR.

When writing, please mention "M. E. and M."

THE NEW LONDON RADIO STATION

(Continued from page 299)

apart, is constructed entirely of wood. It is two hundred and ten feet high and about five feet square. It is of uniform size all the way to the top and there is a ladder running up inside as may be seen from the photograph. To get the best effect from this picture the magazine should be held over the head, as the picture was taken at the bottom of the mast looking up the inside. The pictures taken from the top of the tower show the city of New London on one side and the mouth of the Thames River on the other. In the one of the river mouth may be seen one end of the upper spreader, which is galvanized iron piping about 20 feet in length. The length of the antennæ is approximately 150 feet. In order to give some idea of the height it may surprise the reader to know that there are about five hundred tons in the little coal pile on the end of the dock in the center of the picture and that the wrecking tug at the right is over one hundred feet long.

The transmitting range of the auxiliary set is something over eighteen hundred miles, this distance having been worked with ships of the South American lines. The range of the big set has never been thoroughly tested as this set is seldom used except to send the Block Island weather report and work with WCG at 8 P. M., on a wave-length of 1,800 meters. The note is high, clear and musical.

AN EDITOR'S TROUBLES

The editor of a daily paper appearing at Gary, Indiana, after attempting to satisfy the demands of his polyglot readers by publishing news in Italian, Czech, Croatian, Polish, Hungarian and English, was challenged to a three-cornered duel by two subscribers because he failed to print columns in Russian and Serb. Even in happy Indiana editors can't please everybody.—*Tit Bits.*

In Stockholm, Sweden, there are about 80,000 telephone subscribers for a population of a little over 400,000; or one for every five inhabitants.

Google

EARN YEARLY $3,000 TO $10,000 IN THE REAL ESTATE BUSINESS

FREE BOOK

No matter where you live, if you want an independent business of your own, send your name and address and I will mail you our 64 Page Book, showing how you may earn $3,000 to $10,000 a Year in the Real Estate, Brokerage and Insurance Business.

OUR SYSTEM IS A POSITIVE SUCCESS

We will teach you by mail and appoint you SPECIAL REPRESENTATIVE of the oldest and largest co-operative realty company in the world and help you make money from the start.

EXCEPTIONAL OPPORTUNITY FOR MEN WITHOUT CAPITAL

Write today

J. H. JOICE, Pres. **433 Dearborn St.,** **CHICAGO, ILL.**

FREE BOOK ON MOTORING

A NEW IDEA OF TEACHING BY MAIL WITH DYKE'S WORKING MODELS. CHARTS, MANIKINS, ETC.

Explains how we can start YOU in the Auto Business as Repairman, Chauffeur, Salesman or Auto Mechanician with Dyke's New Idea Working Model System of teaching by mail and our new Idea Employment Plan. Our course simplifies all ignition, Magnetos, Self-Starting and Lighting Systems. Don't miss it—Send for Booklet NOW!

Roe Bldg., ST. LOUIS, MO.

Dyke's School of Motoring, Box 19, Roe Bldg., St. Louis, Mo.

DRAWING OUTFIT $3.75

Regular $8.75 Special

OUTFIT consists of Board, T-Square, Triangles, Fine Set of Instruments, Scale, Tacks, Pencils, Rubber, Curve, etc. Don't think these tools are plaything just because they are low in price. The greatest draftsman on earth can use them. This same outfit is valued by others from $8.00 to $12.00. If you have any mechanical ability buy this outfit and begin to learn how to draw, without spending money on useless instructions. Better outfits for $5.80, $6.75 and $12.60. Send for circular.

Money back if not satisfactory

THE T-SQUARE & TRIANGLE CO., 30-A Clinton Street, NEWARK, N. J.

HOROLOGICAL DEPARTMENT

BRADLEY POLYTECHNIC INSTITUTE

Formerly Parsons Horological Institute

PEORIA, ILLINOIS

Largest and Best Watch School in America

We teach Watch Work, Jewelry, Engraving, Clock Work, Optics. Tuition reasonable. Board and rooms near school at moderate rates. Send for catalogue of Information.

SCHOOL OF AUTOMOBILING

Learn to drive and repair automobiles and prepare yourself for a good paying position. Our practical course enables you to qualify yourself in a short time. Day or Night school. *Write for free Booklet M.*

NORTHWESTERN MOTOR INSTITUTE

228-232 Wisconsin St., Milwaukee.

$20 TO $40 A WEEK SALARY

Paid to Engravers

Get particulars of our Home Study Course. Catalogue Free.

Residence and Correspondence School

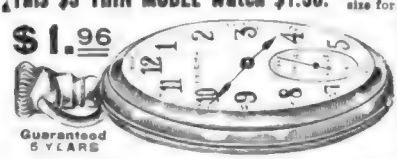
New York School of Engraving

73 Nassau Street, NEW YORK

This $3 THIN MODEL Watch $1.96.

The popular thin model 14 size for men and boys. Adjusted finely finished movement, hard enamel dial, stem wind and pendent set, nickel silver case, dust proof. A correct and reliable timekeeper, fully Guaranteed 5 Years. To advertise our business and introduce our catalogue of watch bargains we will for a short time send this $3 watch by parcel post upon receipt of $1.96, or we will send it C. O. D. by mail and you can pay your postman. Order today. MONEY BACK IF NOT AS REPRESENTED. Address DIAMOND JEWELRY CO., 021 189 W. Madison St., Chicago, Ill

$1.96



Guaranteed 5 YEARS

DON'T TRY TO BE A CHAUFFEUR

GET THIS BOOK FIRST.

or go to ANY SCHOOL to learn, or part with your hard earned dollars until you have read our valuable guide FIRST. It tells what you should PAY and what you should GET. Do not be deceived by schools, which claim everything and give you nothing. YOU CAN'T AFFORD TO SPEND ONE CENT TILL YOU GET OUR GUIDE. It costs nothing and may save you many dollars. Write now for this FREE book.

PRACTICAL AUTO SCHOOL, 70G Beaver St., New York, N. Y.

Ten Days' Free Trial

allowed on every bicycle we sell. We **Ship on Approval and trial** to anyone in the U. S. and *prepay the freight.* If you are not satisfied with the bicycle after using it ten days, ship it back *and don't pay a cent.*

FACTORY PRICES *Do not buy* a **bicycle** or a pair of **tires** from *anyone* at *any price* until you receive our latest **Art Catalog** of high grade bicycles and sundries and learn our *unheard-of prices* and *marvelous new special offers.*

IT ONLY COSTS a cent to write a postal and everything will be sent you **FREE** by return mail. You will get much valuable information. **Do Not Wait; write it NOW!**

TIRES, Coaster-Brake, rear wheels, lamps, parts, repairs and sundries of all kinds at *half usual prices.*

MEAD CYCLE CO. Dept. A-234 CHICAGO

Ruby FREE

To introduce our **Genuine Marteo Gem** (U. S. Letters Patent)—the **only** satisfactory substitute for the diamond that stands all tests and has *permanent* dazzling brilliancy, we make this *special offer:*

If you will mention this advertisement and send us 5 two-cent stamps for our beautiful Art Catalog "The Story of the Marteo Gem," we will send you *free* with catalog a *genuine* Navajo Ruby (sells at 50c.) bought by us from Navajo Indians, together with a cost-price offer for cutting and mounting.

Write today: **FRANCIS E. LESTER COMPANY** **Dept. 56.0. Mesilla Park, N. Mex.**

MEDALS, BADGES AND CLASS PINS

From Factory to You

For College, School or Society.

Special Designs on Request.

Mfgrs. of W. A. O. A. Buttons.

We make Pins and Medals for most of the large schools and colleges.

FRINT & COMPANY, 52 Harrison Av., Jersey City, N. J

When writing, please mention "Modern Electrics and Mechanics."

Digitized by Google

Be Your OWN BOSS
AGENTS EARN BIG MONEY

selling Golden Rule genuine hand forged English Razor Steel Knives. We will put any photo or lodge emblem on one side of the transparent handle, and name and address on the other. We have a complete, fully guaranteed line of knives, razors, strops and cutlery specialties. Quick sales. Big profits. Experience unnecessary. Write today for catalog and terms.

Golden Rule Cutlery Co., 552 W. Lake St., Dept. 108 Chicago

FROM MAKER TO WEARER

SAVE 40 CENTS on every dozen of this regular 2-for-a-quarter smart model—the season's favorite among men who know.

COLLARS
Soft or Laundered $1.10 a Doz.

PAJAMAS
All Styles and Colors $1.10 a Suit.

Send for Catalogue and Pajama Swatch Samples.

LEAGUE COLLAR CO., 9A Hope St., Brooklyn, N. Y.

Furniture On Credit

WRITE FOR MAMMOTH BARGAIN BOOK PICTURING 4,782 ARTICLES.

SPIEGEL, MAY, STERN CO.
1299 West 35th Street, Chicago.

Wm. Gardam & Son, Inc. Cortlandt 3376
Est. over 40 Years
GENERAL MACHINISTS

Models for all purposes
Special machines designed and built
Up-to-date Manufacturing
Experimental work and developing of inventions

"Circular and advice free."

Pattern Making, Gear Cutting, Jigs, Tools and Dies
Drafting and Patent Office Drawings REASONABLE RATES
112 PARK PLACE CORNER GREENWICH STREET

The Crescent Universal Wood Worker

is giving such absolute satisfaction that you could not help but be pleased with it if you want a substantial, durable, convenient combination wood worker. Get our catalog telling all about it, and describing our line of band saws, saw tables, shapers, jointers, borers, planers and matchers, planers, disk-grinders, variety wood workers' band saw blades.

THE CRESCENT MACHINE CO.
45 Columbia Street, Leetonia, O.

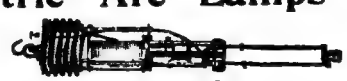
BRASS GEARS

Cut by an entirely new process. The most accurate made and at prices that cannot be equalled by others. Every gear has a hub, center painted ebony back, edges turned true, highest grade red brass, and much heavier than others. We carry the largest stock in the world, and every gear listed is always shipped on date of order.

SEND FOR CIRCULAR

CHICAGO STOCK GEAR WORKS
18 So. Fifth Ave. :: Chicago

Electric Arc Lamps JUST 60 LEFT



A. C. & D. C.

Never used, built for 110 volts, 4 to 5 amperes, 1,000 candle-power: sold regularly at $16. Our bargain price for each like picture, 20 inches long, guaranteed in working order, and one set carbons $3.95

Wireless Instruments a Specialty

COSMOS ELECTRIC COMPANY 138-M Liberty Street, New York

ELECTRICAL EQUIPMENT OF THE PANAMA CANAL

(*Continued from page* 303)

and back of the shaft is fitted with opal glass marked with black lines for the ¼, ½ and ¾ positions. A small aluminum cage moves up and down in each compartment. A drum for operating the cord which raises and lowers the cage is located underneath the control board and is operated by the receiver through a suitable train of gears. To make the indications visible from points up and down the control board, the elevator shaft under each car is always illuminated and the portion above is dark.

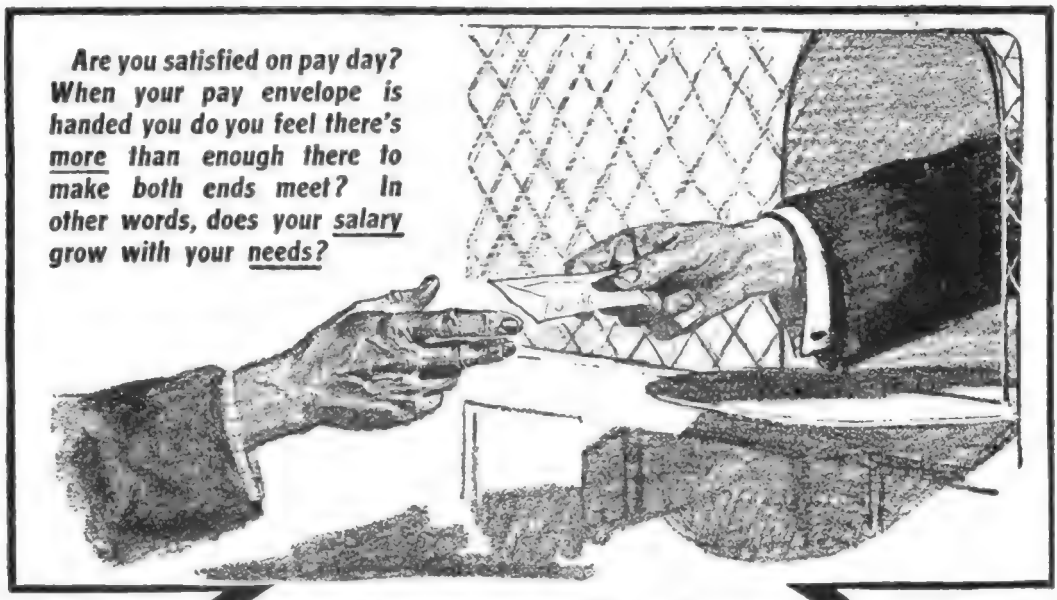
WATER LEVEL INDICATORS

The specifications covering the water level indicators required an accuracy of 1/20 of a foot, or 1/10 of 1 per cent. in actual water level. In the transmitters and receivers for the machines described previously, the rotors turn less than 180 degrees with an inherent lag of 1½ per cent. between transmitter and receiver rotors in this distance, which obviously prevents this arrangement from being employed to give the water level indication.

It was found that if the rotors were revolved ten complete revolutions, the required accuracy could be obtained; but since this arrangement makes it possible for the rotors to be in synchronism every 180 degrees, or in twenty different positions for the entire travel, the indicators would not indicate correctly if for some reason the transmitter rotors were turned more than ½ revolution with the power off. Therefore, the required accuracy was obtained by two sets of transmitters and receivers, one set connected to a fine index in which the rotors make ten complete revolutions, and the other set connected to a coarse index operating less than 180 degrees.

The fine index is a hollow cylinder carrying a pointer, the length of the cylinder being such that when an aluminum ball representing the coarse index, which can be depended upon for coarse indication, is within the limits of the cylinder, the reading of the fine index is correct with-

Google


Are you satisfied on pay day? When your pay envelope is handed you do you feel there's more than enough there to make both ends meet? In other words, does your salary grow with your needs?

Does Your Salary Grow With Your Needs?

Do you want to earn more? You ***CAN.*** Do you want to secure a better position? You ***CAN.*** Do you want to follow some line of work that really appeals to you? You ***CAN.*** In your own home and spare time do you want to acquire the training that will make all this possible? You ***CAN.***

The thing for ***you*** to do to learn ***how*** you can, is to mark the attached coupon and mail it today to the International Correspondence Schools. ***Without charging you a penny or placing you under any obligation*** the I. C. S. will explain just how you ***can*** become proficient in some ***chosen,*** well-paid occupation.

Thousands of other ambitious men have won success through I. C. S. help. Salary increases due to I. C. S. help are ***voluntarily*** reported at the rate of over 400 a month. The I. C. S. didn't care where these men lived, what they did, what they earned, what little schooling, cash, or spare time they had—so long as they could ***read and write,*** and were ambitious, the I. C. S. way was open—just as it is open to ***you.***

Twenty-one years of unparalleled success in raising salaries proves the ability of the I. C. S. to make YOUR salary outgrow your needs. The first step is YOURS—mark and mail the coupon now.

International Correspondence Schools
Box 992, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for a larger salary and advancement to the position, trade, or profession before which I have marked X.

Electrical Engineering	Mechanical Engineer
Electric Lighting	Mechanical Draftsman
Electric Railways	R. R. Construction
Electrician	Concrete Construction
Electric Car Running	Architect
Dynamo Foreman	Contracting and Build'g
Wireman	Architectural Draftsman
Mining Engineer	Plumbing and Heating
Telephone Expert	Chemist
Surveyor	Bookkeeper
Civil Engineer	Advertising Man
Automobile Running	Civil Service Exams.
Agriculture	Salesmanship

Name _____

St. and No. _____

City _____ *State* _____

Present Occupation _____

Google

The "RED DEVIL" Family

IS A VERY LARGE ONE

OVER 3000 MEMBERS—GET ACQUAINTED

Here are two of them

No. 1124

5" and 6½" Sizes

This tool is Bonded, or insured for two years' service. It is a handsome, thin nose model, and will go into many places that the large, bulky pliers will not get into. Your dealer has it—or if not, we will send a sample on receipt of 60 cents, post paid.

No. 542

Convenient 6½" Size

The most powerful nipper made. Hand honed cutting edges. If your dealer can't supply we will send one sample on receipt of 75 cents.

You'll never find "Red Devil" on a poor tool. Send for Booklet.

SMITH & HEMENWAY CO.

155-7 CHAMBERS ST. NEW YORK

Very thing the mechanic has been wishing for: a tool with which he can hold same cutting-tools as a bit-brace and revolve them *by pushing*—like his "YANKEE" Spiral Screw-driver. You'll find it in the

"YANKEE" TOOLS

Make Better Mechanics

Drills 7/64" holes in metal; drives 5/16" auger-bit in hardwoods, and larger in soft. Drives heavy screws; used for tapping, etc. Chuck holds up to 1/2" squares.

"YANKEE" Push Brace No. 75.....$2.80

Your dealer can supply you.

Write for "'Yankee' Tool Book" for mechanics and householders, or "'Yankee' Tools in the Garage" for motorists.

NORTH BROS. MFG. CO. Philadelphia

When writing, please mention "M. E. and M."

in the limits specified. The scales are illuminated by lamps in both base and top caps of the indicator.

For water level indication, wells 36 inches square in the lock walls with communication to the lock by a small opening at the bottom of the well to dampen surges, contain a welded steel box float, 30 inches square by 9 inches deep. A non-slipping phosphor bronze belt transmits the movement of the float to a sheave fitted with pins on the transmitter mechanism, the pins registering with holes punched in the belt. The sheave shaft is carried in ball bearings with oil cups for lubrication and drainage cocks at the bottom of the bearings.

The position of the miter forcing machine is not indicated by synchronous indicators, but its open and closed positions are shown by red and green lights and a mechanical indicator on the control board representing the machine.

CONTROL BOARDS REPRESENT LOCKS IN MINIATURE

The control boards are of the flat-top benchboard type, 32 inches high by 54 inches wide, built in sections, with total lengths as follows:

Gatun .....64 feet
Pedro Miguel .....36 feet
Miraflores .....52 feet

The side and center walls of the locks are represented by cast iron plates and the water in the locks by blue Vermont marble slabs. The outer edge of the board is surrounded by a brass trim rail, and the sides are enclosed with steel plates which can be readily removed for inspection of the board. The control board is supported by a wrought-iron framework resting on base castings, which are in turn supported on the operating floor of the control house.

The control switch handles are mounted above the surface of the board and operate through an angle of 90 degrees. They are provided with name plates for the "open," "closed" and "off" positions. The space immediately below the flat top of the control board is occupied by the contact fingers of the control switches, mounted on the operating shaft, synchronous receivers, and their cable connections. Connection boards are provided for the cables, which are led up from each side, as are buses for supplying current to the control switches, receivers and

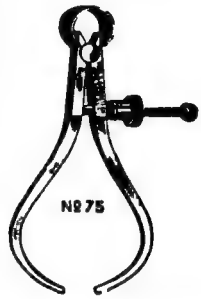
(*Continued on page 371*)

Google

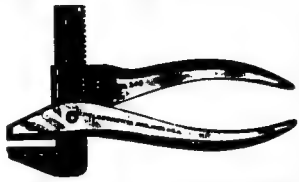
Could You Improve Your Work?

May be you could if you are not a thoroughly experienced mechanic, but we know you could do more work and keep the quality up to your requirements if you had a complete equipment of

Starrett Tools



There is a Starrett for nearly every purpose. There are micrometers, rules, and gages for fine measurements; protractors, squares, levels for laying out work; and expansion pliers, cut nippers, screw-drivers, and ratchet wrenches for your various other needs.



No ad. can do these tools justice nor give you any conception of the variety of tools we make. Send us your name and we will mail you our 250-page free catalogue No. 20W, because it shows the full line with the prices. Write now.

ALL GOOD HARDWARE STORES CARRY STARRETT TOOLS

THE L. S. STARRETT CO. :: Athol, Mass.

42-180

Grobet Swiss Files

are the standard of excellence in files and have been for over 100 years.

We send postpaid as an introducer 48 files especially adapted for tool makers and machinists on receipt of $5.00.

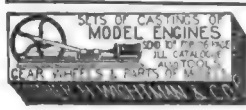
This is a chance to get a set of files you'll appreciate and we'll get future orders.

Montgomery & Co.

103 Fulton St., New York City

A STORY BOOK *FREE*

Very interesting and instructive to those wanting the very best edge tools made. A postal addressed to Mack Co., 18 Brown's Race, Rochester, N. Y., sole makers for more than thirty years of the famous D. R. Barton tools, will bring it with their catalogue. [In writing, mention this magazine.]



Mechanical Supplies and Material of all kinds.
EXPERIMENTAL AND LIGHT MACHINE WORK to order.
132 MILK STREET, BOSTON

WITH A GENUINE ARMSTRONG STOCK

and a JUNIOR HINGED PIPE VISE which holds pipe from ⅛ to 1¼ in. a fitter can pipe any ordinary building. Jobbers sell them.

Manufactured by

THE ARMSTRONG MFG. CO., 337 Knowlton St.

New York BRIDGEPORT, CONN. Chicago

NEWARK ELECTRICAL SUPPLY CO.

We sell *EVERYTHING ELECTRICAL*

Our Wireless Manual and Electrical Material Catalog GRATIS

Write for it

281 MARKET ST. NEWARK, N. J.

Digitized by Google

BOOK REVIEWS

Any book reviewed in these columns may be secured through our Book Department.

A HANDBOOK FOR PRACTICAL ELECTRICIANS

In reviewing the work entitled "American Electrician's Handbook,"* one cannot help but highly praise its author for the great service he has rendered to the electrician by placing at the latter's disposal a veritable storehouse of practical information. This book is strictly intended for the practical electrician and comprises a most excellent reference work.

The "American Electrician's Handbook" contains all the necessary information required by anyone engaged in electrical construction. It covers the fundamentals of electricity and electrical work, generators and motors, outside distribution, interior wiring, transformers, illumination, and contains a complete index for readily locating any desired information. All these topics are again subdivided into numerous items so as to cover every possible feature. Tables and formulæ are found in profusion while diagrams are given in every instance where they can aid in enhancing the description.

It is impossible to do justice to this work in a short review, for it must be examined to be appreciated. Its 711 pages of text comprise an electrical reference library that would be difficult to equal even if several books were gathered together. In all, the work is highly commendable to anyone interested in any branch of electricity.

* *American Electrician's Handbook*, by Terrell Croft. Published by McGraw-Hill Book Company, 239 West 39th Street, New York. Contains 711 pages and is profusely illustrated. Bound in flexible morocco leather with gilt lettering. Price, $3.00.

DESIGN AND CONSTRUCTION IN WOOD

Under the title of "Design and Construction in Wood,"* a most interesting work has been prepared for the teaching of designing and wood-working to beginners. The book is a companion volume to "Handword in Wood" and "Wood and Forest," by the same author, William Noyes.

The work has been well handled and attractively illustrated. Its opening chapter deals with wood, its qualities, characteristics and the various kinds of wood. Then follow chapters describing the designing of woodwork as well as the finishing of it, and the necessary tools, benches and other equipment for making the articles that are later described. The remainder of the book is devoted to the construction of various pieces, such as scrap baskets, letter trays, flower pots, picture frames, glass-bottomed trays, candlesticks, taborets, trays, rolling blotter holders, small boxes and lanterns. All the descriptions are quite clear and readily followed, while the illustrations comprise working diagrams and handsome halftones of the finished articles.

"Design and Construction in Wood" should be in the hands of all persons interested in wood-working as well as anyone desirous of making simple yet attractive pieces for the beautifying of the home.

* *Design and Construction in Wood*, by William Noyes, Assistant Professor of Industrial Arts, Teachers' College, Columbia University. Published by The Manual Arts Press, Peoria, Ill. Contains 159 pages and 204 illustrations. Cloth Bound. Price, $1.50.

RADIO TELEGRAPHY AND TELEPHONY

Perhaps no better book could be found for the beginner in wireless than that prepared by Mr. Alfred P. Morgan under the title of "Wireless Telegraphy and Telephony Simply Explained."* Although there are numerous works now available for students in radio communication, there are few as suitable for the layman.

The opening chapter deals with the simple principles involved in radio transmission and reception, followed by descriptions of receiving and transmitting apparatus, tuning and coupling, the application of wireless telegraphy to various purposes, wireless telephony, and finally, the conclusion in which Maxwell's theory, Hertz's discovery, electromagnetic waves, wireless telegraphy to-day, and other topics are discussed.

* *Wireless Telegraphy and Telephony Simply Explained*, by Alfred P. Morgan. Published by The Norman W. Henley Publishing Co., 132 Nassau Street, New York City. Contains 154 pages and 156 illustrations. Cloth bound. Price, $1.00.

SCIENTIFIC PROOFS OF ANOTHER LIFE

Although it must be confessed that works pertaining to the subjects that are remote from electrical, mechanical or wireless topics are foreign to the field of this publication, it was with much interest and pleasure that we reviewed a copy of a spiritualistic book entitled "Scientific Proofs of Another Life."*

The remarkable feature of this work—one that places it in a distinct field by itself and confers upon it the honor of being the first book of its kind—is that it has been entirely written by spirits of departed eminent persons, according to the statements of the publishers. In view of the continual exposure of imposters in spiritualism as well as the prevailing skepticism among the general public, it is rather a difficult matter for the average

(*Continued on page* 363)

Google

How to cash-in on Your Ideas

NO inventor or Manufacturer can afford to be without these volumes —prepared by Patent Experts and sent to you anywhere without a cent of cost. If you have an idea these books show you how to protect it—if you have secured a patent they may help you to sell it. There are suggestions for ideas that you may work out and sell—and if you are seeking a profitable investment, many big, money-making plans are offered.

This library gives you a complete grasp of patenting and protecting the product of your brain. It explains every step—points out pitfalls—guides you to success. It tells you what to invent, what to do with it, how to make the most money out of it.

Protection and Help

It shows you how you may become famous and independently rich—how to turn your spare time into money—how to accomplish results at the least cost. It tells of Prizes offered—gives suggestions—explains every detail of the safeguards we place about your work. Every page is practical, helpful, profitable. **You** will be glad to know all these facts.

What the Nation's Leaders Say of Our Service . . .

"It gives me pleasure to state that I am acquainted with the firm of Randolph & Co., Patent Attorneys, of this city, and believe them thoroughly reliable, capable and exceedingly well equipped to look after the interests of their clients."

CHAMP CLARK,
Speaker House of Representatives.

"It has not been given to me to form the personal acquaintance of Randolph & Company, patent attorneys of this city, but as I have been frequently requested to recommend such attorneys to inquiring friends throughout the United States, it has become necessary for me to inquire with reference to the capacity and attention to business of this firm. I have learned that they are thoroughly up to-date and have taken great pleasure in personally recommending them to inquiring friends."

THOS. R. MARSHALL,
Vice-President of the United States

We Help to Find Buyers for Your Ideas

In a 52 page Bulletin we send you requests from hundreds of wealthy men seeking to purchase patents—enabling you to work intelligently, to the point. It gives you live leads—tells you where money is and what will get it. Without a cent of charge we will put you in touch with the men you are seeking or the man who is seeking **you.**

Free Search of U. S. Patents

Send us a Model or Sketch of your Invention for Free Search of U. S. Patents—saving you time, trouble, and money. We will then secure for you Patents, Trademarks, Copyrights, submitting the most Liberal Terms ever offered.

Our Offer to You

Rejected cases are our specialty. Our motto is thoroughness. We advertise your patent for sale in our Sales Bulletin, and look after your every interest. Our service is a boon to the man who has not money to carry his idea to proper markets. It may solve your problem and **make your fortune. Remember, these books are absolutely free.** If you have an idea and want to sell it, write us fully. To get these valuable books *free*—simply write your name and address on the margin below—tear off and mail it to us *now.*

SEND NO MONEY — MAIL COUPON NOW

What is in these FREE Books for YOU

"Inventions Needed" tells of hundreds of inventions the world needs—that capital is seeking. Fortunes are awaiting men who can supply them. In 196 pages this interesting book points out the road to Wealth and Fame—tells you How and Why.

"How to Get Your Patent and Your Money" tells the experience and lessons of Inventors who have made good—shows you how to market **your** invention and **get the most money for it.** Its 132 pages contain a wealth of information fully illustrated—that enables you to turn your ideas into money. It explains costs, ways, legal points—guards you against loss and disappointment.

"Millions in Patents." in 100 pages, reads like a fairy tale, but it is all hard, cold fact. It tells what others have done—what **you** can do—how, with a little energy and patience, you can join the few who have grown rich through successful inventions.

"Foreign Patents" shows how we help you collect the fortunes to be made in the world-wide market for your ideas—explains how we protect you in furnishing the new inventions the world is seeking from men of increasing energy and ability. Reading like a romance, this book is thoroughly practical—cram full of profitable suggestions.

"What is a Trademark"—Billions of dollars have been made out of Trademarks. Manufacturers pay fortunes for them. This book shows you how to protect your business trademarks against theft or imitation, and is full of essential, money making knowledge.

You Need this FREE INFORMATION NOW

L. F. RANDOLPH & CO., *Patent Attorneys*
Dept. 130, Washington, D. C.

Send me the five Free Books you offer and explain your service fully.

Name.....

Street Address.....

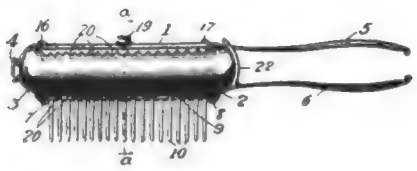
P.O. and State.....

Send No Money - Mail Coupon Now

Digitized by Google

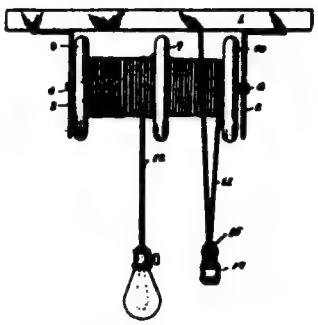
Recent Novel Patents

1,084,743. LIQUID-APPLYING COMB AND THE LIKE. Frank C. Jones, Sumter, S. C. Filed Feb. 17, 1913. Serial No. 748,982. (Cl. 132—8.)



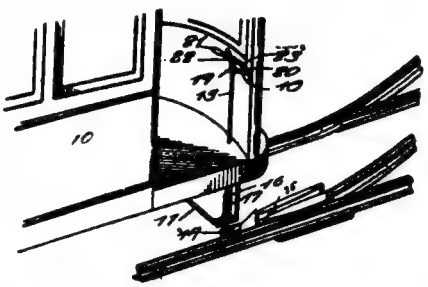
1 In a device of the character described, a main body portion of substantially U-shaped form, a hollow toothed comb and tank supported by said body portion said tank mounted directly above the toothed comb, communications between the tank and teeth of the comb, and handle portions carried by and extending beyond said body portion for compressing said tank.

1,084,960. LAMP-CORD REEL. Marion I. Randall, Bellingham, Wash. Filed Jan. 28, 1911. Serial No. 606,281. (Cl. 242—109.)



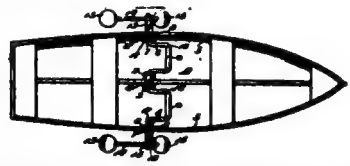
The combination with a support, of a lamp cord reel attached thereto and comprising bearing brackets, a spring retracted drum journaled in said brackets, said drum being divided into sections, a lamp cord extending downwardly from the support and then upwardly to form a loop, it being then wound upon one of the drum sections in one direction and oppositely wound upon the other section and adapted to depend therefrom, and a weight having a roller supported by the loop in the cord.

1,083,286. SWITCH-OPENER. Harry J. Lantz, Augusta, N. J. Filed Mar. 11, 1913. Serial No. 753,581. (Cl. 104—171.)



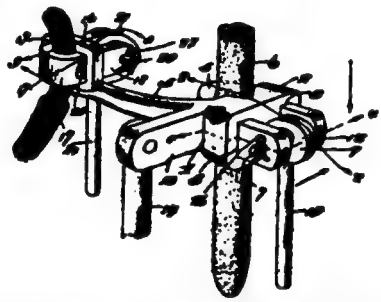
A switch throwing device for railway cars including a hanger, a spring controlled vertically movable rod mounted in said hanger, a switch throwing shoe on said rod, a substantially V-shaped bracket having an opening loosely receiving said rod, an arcuate fulcrum bar spanning the legs of said bracket, and a lever pivoted intermediate the ends to the upper end of said rod and having a terminal ring encircling said fulcrum bar.

1,084,798. ROWBOAT-PROPELLER. Joseph Granquist, Salt Lake City, Utah. Filed June 14, 1911. Serial No. 633,045. (Cl. 115—23.)



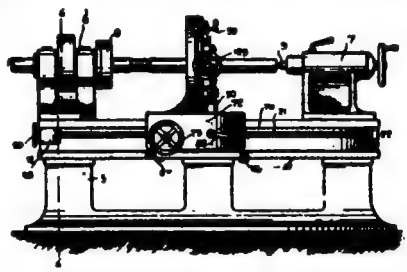
The combination with a boat, of a pillow post carried centrally within said boat, oppositely positioned journal bearings secured to the gunwale of the boat in alinement with said pillow post, two crank shafts each having one end revolubly held by said pillow post the other end of each shaft projecting through one of said bearings, a paddle head having a plurality of crosswise running apertures secured to the outer end of each crank shaft, a plurality of bars slidably held within each head aperture, and a curved paddle secured to each end of each bar.

1,084,879. SCREWLESS CARBON-HOLDER. William W. Wile, Bluffton, Ind. Filed Oct. 10, 1912. Serial No. 724,998. (Cl. 176—119.)



1 In a carbon holder comprising an arm terminating in a head plate provided with parallel spaced apart oblong openings and having a flat cam engaging surface between the openings, a U-shaped clamp having spaced apart arms oblong in cross-section adapted to fit and to be inserted in said opening, a pin mounted in the arms of said clamp, and a cam member mounted upon said pin adapted to engage the flat surface between the openings for drawing the arms through the opening, whereby a member terminal may be clamped between the crotch of the clamp and the head plate, said cam member having a surface parallel with the flat surface between the openings constituting means for equally drawing the arms through the openings.

1,082,652. LATHE. Charles F. Roth, Pilot Grove, Mo. Filed May 24, 1913. Serial No. 769,751. (Cl. 82—20.)



1. In a lathe, a sliding carriage, a plurality of shaft cutting members mounted for radial movement upon said carriage, means for sliding the carriage, and electro-mechanical means for alternately moving the cutting members inwardly and outwardly toward or from the axial center of the shaft at predetermined times in the longitudinal sliding movement of said carriage.

Google

PATENTS

If you have an invention which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of nearly seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand-Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to ***Patents, Trade Marks, Foreign Patents,*** etc.

All patents secured through us are described without cost to the patentee in the SCIENTIFIC AMERICAN.

MUNN & COMPANY

SOLICITORS OF PATENTS

351 BROADWAY, NEW YORK

and 625 F STREET, WASHINGTON, D. C.

PATENTS

TRADEMARKS AND COPYRIGHTS

Secured or Fee Returned

Send model or sketch and description of your invention for free search of the U. S. Patent Office Records.

OUR BOOKS mailed free to any address. Send for these books; the finest publications ever issued for free distribution.

HOW TO OBTAIN A PATENT. Our illustrated 80 page Guide Book is an invaluable book of reference for inventors and 100 mechanical movements illustrated and described.

FORTUNES IN PATENTS. Tells how to invent for profit and gives history of successful inventions.

WHAT TO INVENT. Contains a valuable list of *New Ideas Wanted.* Also information regarding prizes offered for inventions, among which is a **Prize of One Million Dollars** offered for one invention and $10,000 for others.

PATENTS THAT PAY. Contains letters from successful clients. **List of Patent Buyers.** Also endorsements from prominent inventors, manufacturers, senators, congressmen, governors, etc.

We advertise our clients' inventions free in a list of Sunday newspapers with two million circulation and in the World's Progress. Sample copy free.

Electrical Cases a Specialty. We have secured many important electrical patents.

Victor J. Evans & Co.

Victor Bldg., 724 9th St., N. W., WASHINGTON, D. C.

WANTED-IDEAS

Manufacturers are constantly writing me for new ideas protected by OWEN PATENTS. Send for my free literature and read their wants.

FREE! Three finest patent books published! 72-page guide "Successful Patents;" "Stepping Stones" (containing list of over 200 inventions wanted; tells the plain truth about prizes, reward offers, etc.) and "Patent Promotion" (tells how to sell your rights; chief causes of failure, etc.) All sent *free upon request.*

Very highest references. I help my clients sell their patents or dispose of their applications. Advice free. No obligation incurred by writing me. Free manufacturing facilities. I secure patent or no fee. No charge for report as to patentability, practicability, etc.

RICHARD B. OWEN, 82 Owen Bldg., Washington, D. C.

PATENTS

Trade Marks and Copyrights

Send your business direct to Washington. Saves time and insures better service.

Personal Attention Guaranteed

30 Years Active Practice

BOOK WITH TERMS FREE

E. G. SIGGERS

Patent Lawyer

SUITE 2, N. U. BLDG., WASHINGTON, D. C.

LEARN HOW A PATENT MAY BE MADE VALUABLE

Send for This FREE BOOK which tells you { WHAT YOU SHOULD KNOW / WHAT TO INVENT / WHAT NOT TO INVENT / HOW TO SELL YOUR PATENT

Copies of nearest Patents and report in every case without charge

H. L. WOODWARD, 900 G St., Washington, D. C.

PATENTS

BUILD FORTUNES FOR YOU

Our free booklets tell how, what to invent, How To Choose An Attorney, and save you money.

Prosperous clients in all states. Best Bank and other references. WRITE TODAY

D. SWIFT & CO., 315 SEVENTH ST., WASHINGTON, D. C.

PATENTS

C. L. PARKER

Ex-member Examining Corps U. S. Patent Office

Patent Lawyer

8 McGill Bldg., Washington, D. C.

Patents, Trademarks, Copyrights, Patent Litigation

Handbook for Inventors, "Protecting, Exploiting and Selling Inventions" sent free upon request.

Patents Procured and Sold

Your idea will have a cash value when patented; build a business on your idea or patent and sell it outright; good inventions make fortunes; copyrights, trademarks and designs also; BOOK FREE; send sketch to-day.

H. J. SANDERS

2 Webster Building, Chicago.

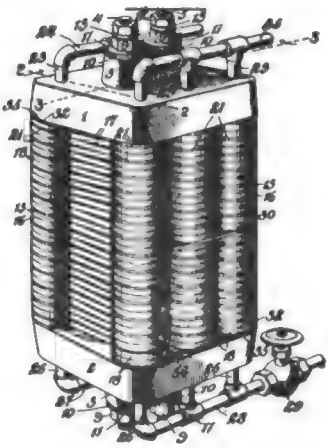
Digitized by Google

Recent Novel Patents

1,083,175. COMMUTATOR-SLOTTER. Frank Russell Alley, Seattle, Wash. Filed May 28, 1913. Serial No. 770,349. (Cl. 29—76.)

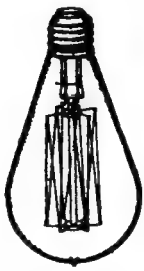
1. A commutator slotting tool comprising a body having transversely-extending guide-ways disposed parallel and spaced apart, a single rotating element in each guideway, a member engaged with each element and moved longitudinally thereof by rotation of the elements, a cutter mounted on the members and disposed below the same and below the body, and a guide adjustably mounted on the body and extending substantially parallel with the cutter.

1,083,191. THERMO-ELECTRIC GENERATOR. James J. Cook, Jersey City, N. J. Filed Mar. 25, 1911. Serial No. 616,825. (Cl. 171—73.)



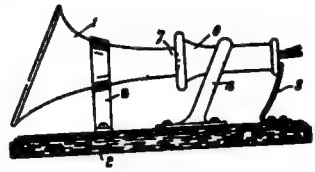
1. An element for a thermo-pile with the terminal portions alike and each having a passage therethrough for a temperature controlling medium, said terminals each being of the same thickness throughout from the mid line of the element toward both faces of said terminal portion.

1,082,933. TUNGSTEN AND METHOD OF MAKING THE SAME FOR USE AS FILAMENTS OF INCANDESCENT ELECTRIC LAMPS AND FOR OTHER PURPOSES. William D. Coolidge, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed June 19, 1912. Serial No. 704,580. (Cl. 176—132.)



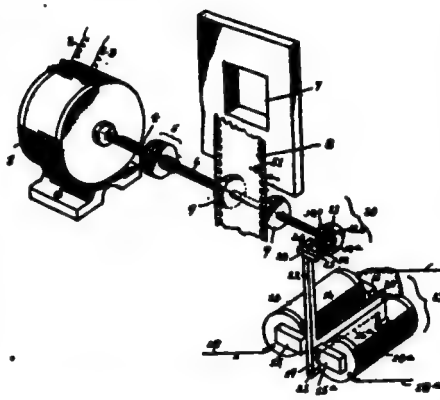
1. The process of producing tungsten having a fibrous structure which consists in repeatedly hot working a crystalline body of tungsten until the crystalline structure is broken down and a fibrous structure developed.

1,084,822. LOUD-SPEAKING ATTACHMENT FOR TELEPHONES. Henry Waymouth Francis, London, England. Filed June 25, 1913. Serial No. 775,698. (Cl. 179—182.)



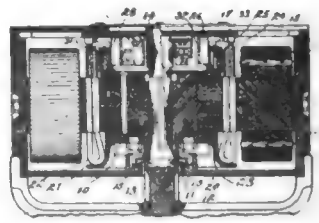
The combination, with a supporting base, and a trumpet secured thereto and having its main portion arranged horizontally; of an inclined guide secured to the base plate to the rear of the inlet opening of the trumpet and adapted to press the front end of a telephone receiver against the trumpet, a support secured to the base between the trumpet and the guide, and a telephone receiver supported horizontally and held in line with the inlet opening of the trumpet by the said support and guide.

1,083,498. SYNCHRONIZING PICTURE-EXHIBITING AND SOUND-RECORD MACHINE. Isidor Kitsee, Philadelphia, Pa., assignor to The Cort-Kitsee Co., a Corporation of New York. Filed Aug. 5, 1911. Serial No. 642,453. (Cl. 88—16.2.)



1. In mechanism for synchronizing the movement of sound reproducing and motion picture machines, operating means for the picture-carrier, a source of power tending to constantly actuate said operating means, and means controlled by the sound reproducing machine for intermittently interrupting the movement of the picture-carrier-operating means.

1,083,260. ELECTRIC MOTOR. Ralph E. Noble, Chicago, Ill., assignor to Morgan-Gardner Electric Company, Chicago, Ill. Filed July 2, 1910. Serial No. 570,102. (Cl. 171—306.)



1. In a motor or the like, the combination of a barrel wound armature, with a commutator extending wholly within the end turns of the armature winding.

Google

PATENT YOUR IDEAS

$9,000 offered for certain inventions. Book "How to Obtain a Patent" and "What to Invent" sent free. Send rough sketch for free report as to patentability. Patents advertised for sale at our expense in Manufacturers' Journals.

CHANDLEE & CHANDLEE, Patent Atty's
Est. 16 Years 1006 F. St, Washington, D. C.

INVENTIONS perfected; IDEAS developed
Specialist in the development of patents
Legal and Technical ADVICE FREE
R. SHELMO-JACOBSEN
Consulting Engineer
452 Peoples Gas Bldg., Chicago

PATENT SECURED OR FEE RETURNED

Send sketch for free search and report as to patentability. Books on inventions and patents, and reference book sent free. John S. Duffie & Co., 603 F St., Washington, D. C.

Official Drawings Free

Patents procured or fee returned. Expert services. Send sketch for free search.

THE PATENT EXCHANGE
Jerden Building, Washington, D. C.

PATENTS
THAT PROTECT AND PAY
BOOKS, ADVICE AND SEARCHES **FREE**
Send sketch or model for search. Highest References
Best Results. Promptness Assured.
Watson E. Coleman Patent Lawyer
624 F Street, N. W. Washington, D. C.

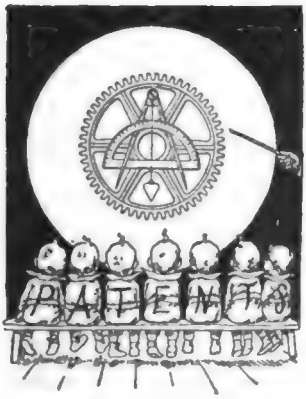
For Interesting and Valuable Information about
PATENTS WANTED
and *bought* by Manufacturers, send 6 cents postage for large illustrated paper *Visible Results* and Terms Book.
R. S. & A. B. LACEY, Dept. 6, Washington, D. C. Estab. 1869.

WALTON HARRISON
No. 2 Rector Street, N. Y. City
[Formely Asst. Examiner U. S. Patent Office]
WIRELESS PATENTS
Also Electrical, Mechanical and Chemical Patents

TRY ME

PATENT
25 years practical experience in inventing, making, patenting and selling electrical and mechanical devices.
H. C. THOMSON
266 Easton Bldg., Boston, Mass.
Exclusive Washington Rep
PATENT

MIATT Procures
PATENTS
1868 - 1914



G. W. MIATT, Counselor at Law
Solicitor of U. S. and Foreign Patents, etc.
Offices: Temple Court, 5 and 7 Beekman St., NEW YORK
'Phone, 5437 Cortlandt; Night, 3390 Morningside

MONEY

for you if you only start right. All you require is one good Idea and your fortune is made.

Let us aid you in developing your ideas and put them in good commercial shape.

We can do the same for you that we have done for others. We know how things must be made to have a market value.

With our staff of trained engineers and mechanics we are able to design anything no matter how small or how large; how simple or how intricate the article may be we can handle it, and save you money.

Don't waste your money on expensive patents before you have your invention perfected, you may have the same expense over again.

Our receipt for your idea is safer and a better protection to you than anyone else can give you.

What Means Have You to Get in Contact with the Right People?

We are right in the center of all business and it will be to your interest to consult us.

We Manufacture in Any Quantity

and make parts by the piece of every conceivable material with greatest accuracy.

GEARS of all descriptions.

Differential and straight magnet winding, etc.

FREE—We will give you advice on all technical questions direct if you enclose a 2c stamp for postage.

MULLER & JABLONSKY
Bank and Bleecker St. New York

Digitized by Google

NEW THINGS

Electrical—Wireless—Mechanical

HIGH GRADE WIRELESS APPARATUS

The Clapp-Eastham Company, 139 Main St., Cambridge, Mass., have recently issued a new catalog in which their latest types of wireless apparatus are described at length.

Among the apparatus mentioned in the catalog are: High Tension Magnetic Leakage Transformers, Type E Wireless Transformers, Wireless Keys, Hot Wire Meters, Helices, Transmitting Condensers, Adjustable Spark Gaps, Antennae Switches, complete Sending Sets," "The Hytone" Rotary Quenched Spark Transmitting Sets, Potentiometers, Receiving Transformers, Fixed Condensers. Tuning Coils, Detectors, Variable Condensers, Telephone Receivers, Wave Meters, and Complete Receiving Sets.

All of the apparatus is shown in elaborate illustrations, while the descriptions cover all the details that can prove of interest to prospective buyers of wireless instruments. The catalog contains 32 pages and considerable valuable information in the way of wiring diagrams and other instructive matter. Copies may be obtained by addressing the firm at the above mentioned address.

A SCHOOL OF TELEGRAPHY

Having outgrown its former quarters at 354 East 152d St., the Barrett's School of Telegraphy has recently opened a new school at 519-527 Courtland Avenue, New York City.

This school, although but a few years old, has done some notable work in turning out expert operators, both male and female, who

BUILDING OCCUPIED BY THE BARRETT'S SCHOOL OF TELEGRAPHY

are now engaged in various branches of telegraphy. Commercial, wireless and railway telegraphy are taught in Barrett's School of Telegraphy.

It is said that hundreds of dollars have been spent to make the new school a place where the students can be taught thoroughly and

VIEW OF A CLASS ROOM IN THE SCHOOL

prepared to qualify for good operating positions with any of the large telegraph companies or railroads immediately after leaving the school. Former students are now employed by both the Marconi and Telefunken Companies.

The new quarters are equipped with two complete sets of wireless apparatus—one a high-toned quenched set and the other a Telefunken set which is used for tuning purposes by the students in conjunction with a wavemeter. Special courses are given for those who desire to qualify for a first grade commercial license, providing they already have an amateur license. There is also a special electrical course for those who are already proficient in the code test.

Prospective students are cordially invited to inspect the new school and secure particulars regarding both the day and evening courses. Literature will be sent on request.

AN EFFICIENT TRANSMITTING CONDENSER

In any straight competition between home-made wireless apparatus and the output of the established manufacturer, the verdict is rarely in favor of the former. This is particularly true as regards transmitting apparatus and in no case is this more pronounced than in the ever vexatious problem of transmitting condensers.

The amateur who places his dependence upon home-made condensers frequently finds, to his sorrow, that his good intentions and his hard work end in temporary satisfaction, quickly succeeded by a catastrophe in which punctured plates and blistered foil are the outward evidences of his misfortune. Even if a total catastrophe be averted, it is reasonable

Google

to assume that his completed condenser must snow the losses inseparably associated with the best condenser of the type which he can make.

The Moulded Transmitting Condenser, manufactured by the Wm. J. Murdock Company, is notable as a distinct departure from accepted forms. It is made in plate form, with interleaved sheets of foil and dielectric moulded under tremendous pressure into solid sections each of .0017 mfd. capacity.

Three distinct advantages are gained in this method of construction. In the first place, the solid section is physically so strong as to require a disruptive force exceeding anything of common occurrence to break it. Secondly, a condenser section, measuring approximately 6 x 6 x 1 inches has a capacity from 3 to 6 times as much per unit of volume as any other known form of condenser This means exceptional economy of space. Lastly, the great pressure used in moulding the condenser so intimately connects the foil and the dielectric that all brushing effects are eliminated, and internal losses are reduced to a minimum. On actual test this condenser shows less internal losses in operation than any condenser made, excepting only the compressed air condenser, which on account of its great size and cost is out of the question for amateurs.

The Wm. J. Murdock Co. have recently completed exhaustive tests of the Moulded Condenser with rotary gaps on a 200 meter wave-length and have secured most satisfactory results, which they believe confirm their claim that the Moulded Condenser is the most efficient and economical type to use in this connection.

Those who may be interested in this condenser would do well to communicate with the Wm. J. Murdock Co., 40 Carter St., Chelsea, Mass.

A MODERN TRADE SCHOOL

In a large and handsomely prepared catalog, the Coyne National Trade Schools have clearly set forth their various courses as well as what they are accomplishing for their numerous students. This catalog contains many illustrations that show students at work in the various departments, officials and instructors, the equipment of the school and other interesting scenes.

The Coyne National Trade Schools teach electrical work, plumbing, bricklaying, mechanical drawing and moving picture operating. Not only are these trades taught from a practical standpoint, but the students are also trained in the technicalities of the various subjects. Many testimonials appearing in this catalog go to prove that the training secured in that institution is indeed a very profitable investment.

Anyone desirous of securing a copy of this catalog can do so by addressing The Coyne National Trade Schools, Dept. 1492, 51 East Illinois Street, Chicago, Ill.

WIRELESS APPARATUS OF ALL KINDS

The Haller-Cunningham Electric Company of 428 Market Street, San Francisco, Cal., has just issued a new wireless catalog in which

GREATEST BARGAINS *in* HISTORY *of* TYPEWRITERS

3,000 Machines to Select From

Underwoods	$30.00
Olivers	25.00
L. C. Smiths	27.00
Remingtons	15.50
Royals	30.00
Smith Premier	16.50

and other makes $10 and up. Expert repairing and rebuilding. Every machine in perfect condition and guaranteed two years. Write for our liberal free trial offer and cut rate prices.

All-Makes Typewriter Exchange Co.
155 N. Clark St. Chicago, Ill.

PATENTS

No attorney fees until patent allowed
Registered attorneys make our searches
Send Sketch for FREE REPORT. FREE BOOKS.
FULLER & McLACHLEN
McLACHLEN BANK BLDG., WASHINGTON, D. C

A Patent Experience of 23 Years

Makes my services invaluable to inventors in securing broad patents. My free book explains fully. Write for it today.

A. M. WILSON, 309 VICTOR BUILDING, WASHINGTON D. C.

GUSTAV RASMUS, M.E.
PATENT ATTORNEY and CONSULTING ENGINEER for 17 Years
Active Head of Various Important Industries and Manufactories
Specializing in Patent Matters in the Mechanical and Electrical Arts
Correspondence Invited
2 RECTOR STREET - - - NEW YORK

PATENTS SECURED

Send sketch or model for search. Book containing over 200 mechanical movements, free.

W. N. ROACH, Jr., 983 McGill Bldg.
Washington, D. C.

INVENTORS

There is always a demand for good INVENTIONS. Send me sketch or model of your invention and I will advise you without charge as to its Patentability, Practicability and possible commercial value.

Write for CARD which will entitle you to advice by mail FREE

ARTHUR PHELPS-MARR
Solicitor for Patents and Electrical Engineer
106-110 Fulton St., - New York

Digitized by Google

The Greatest Electrical Handbooks Ever Published - $1.00 to $4.00

Simply written and containing numerous illustrations, diagrams, formulas, etc., for home study and self-instruction.
They are of as great value to the experienced worker as to the beginner, and compose the most helpful, reliable and comprehensive series of Electrical Engineering handbooks ever before placed upon the market.

ELECTRIC RAILWAYS. By **James R. Cravath,** Western Editor, *Street Railway Journal.* 176 pp., 125 illus. Cloth binding. It covers every detail of the trolley and third-rail systems, their construction and operation, power generation and distribution, the electric locomotive, etc. Price, ... $1.00

THE ELECTRIC TELEGRAPH. By **Chas. Thom,** Chief Quadruplex Department, Western Union Telegraph Co., and **A. Frederick Collins,** Author of "Wireless Telegraphy, Its History, Theory, and Practice." 160 pp., 81 illus. Cloth binding. Simple apparatus; codes; the Morse code; messages; press service; cipher messages, etc.; abbreviated telegraphy; railway telegraphy; forms; junction stations; switchboard; batteries; systems; single-line repeaters; multiplex telegraphy; duplex; the quad; phonoplex; wireless telegraphy; construction of apparatus; wireless systems. Price.....$1.00

POWER STATIONS AND TRANSMISSION. By **George C. Shaad, E. E.,** Professor of Electrical Engineering, University of Kansas. 176 pp., 100 illus. Cloth binding. A manual for Electrical Engineers and Electrical Workers in general. Price..... $1.00

ELECTRIC WIRING AND LIGHTING. By **Charles E. Knox, E. E.,** consulting Electrical Engineer, and **George C. Shaad, E. E.,** Associate Professor of Electrical Engineering, Massachusetts Institute of Technology. 208 pp., 150 illus. Cloth binding. Price..$1.00

PRACTICAL LESSONS IN ELECTRICITY. By **F. B. Crocker, E. M., Ph. D.,** Head of Department of Electrical Engineering, Columbia University, Past President, American Institute, Electrical Engineers; **H. C. Cushing, Jr.,** Consulting Electrical Engineer, and **Lawrence K. Sager, S. B., M. P. L.,** Patent Attorney and Electrical Expert. 272 pp., 128 illus. Cloth binding. A practical guide for Electrical Workers. Price $1.50

DYNAMO - ELECTRIC MACHINERY. By **F. B. Crocker, E. M., Ph. D.,** Head of Department of Electrical Engineering, Columbia University, Past President, American Institute Electrical Engineers. 256 pp., 260 illus. Cloth binding. A complete and authoritative treatise on the theory, constructive details, calculation, and design of dynamo-electric machinery. Price $1.50

ALTERNATING - CURRENT MACHINERY. By **William Esty, S. B., M. A.,** Head of Department of Electrical Engineering, Lehigh University. 462 pp., 400 illus. Half Morocco binding. An authoritative and up-to-date work adapted to the needs of all classes of Electrical Workers. Price, $3.00.

TELEPHONY. By **Kempster B. Miller, M. E., and Samuel G. McMeen,** Consulting Electrical Engineers and Telephone Experts. 960 pp., 671 illus. A complete working guide to modern telephone practice. Price.....$4.00

Sent, postpaid, to any address upon receipt of price.

MODERN PUBLISHING CO.

231 FULTON STREET **NEW YORK CITY**

Digitized by Google

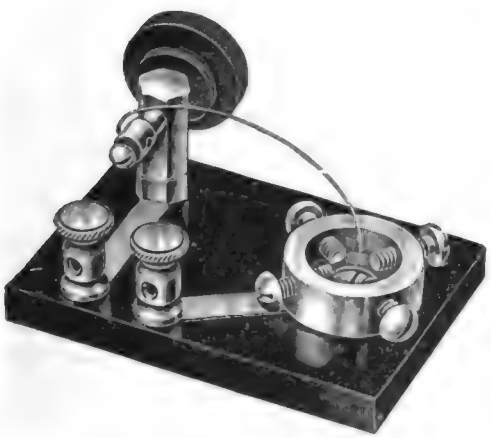
the entire line of "Halcun" wireless telegraph apparatus is illustrated and described.

Among the products listed in the catalog are: Rotary Condensers, Fixed Condensers, Wave Meters, Rotary Spark Gaps, Interference Preventers, Loose Couplers, Transmitting Condensers, Receiving Transformers, Sending Transformers, Detectors, Complete Receiving and Sending Sets of all kinds, Aerial Switches, Spark Coils, Hot Wire Ammeters, Break-In Keys, Telephone Receivers, and all the necessary supplies for erecting a wireless station. This catalog contains 32 pages and is profusely illustrated.

Several novel and striking features are offered in "Halcun" wireless apparatus, and anyone interested in either installing a complete wireless station or improving his present apparatus will do well to write for a copy of the catalog.

AN EFFICIENT DETECTOR

In the accompanying illustration is shown the new detector recently introduced by A. H. Grebe & Company, 10 Van Wyck Ave., Richmond Hill, N. Y.



NEW TYPE OF CRYSTAL DETECTOR

This detector permits of three adjustments—the tension on the wire touching the crystal can be varied, the wire can be moved from one side to the other, and the crystal cup can be rotated to any position. The unique feature of this detector is that friction bearings are employed so that any adjustment made will be permanent. The pillar holding the adjusting handle rod is pivoted in order that the wire may be moved from one side to the other on the surface of the crystal.

The detector has a genuine hard rubber base, and all the metal parts are made of brass, attractively and durably nickel plated. It is the result of considerable experience in the building of radio apparatus and is said to be mechanically and electrically perfect. This detector is endorsed by commercial wireless operators and is proving highly satisfactory wherever it is employed

This detector is being sold at the very popular price of $2.00, postpaid. Aside from this

CLARK'S

Secret Temper Blades

(in the Red Box)

—guaranteed to shave the *wiriest, stiffest* beard at least *five times without stropping*. Cut clean and smooth—a joy to use. Pick the blade that fits your razor, or mention the make, and send for a package to-day or tell your dealer to get them for you. If none of the four fit your razor

Send 50c and we will send you a package of five Clark Secret Temper Blades (*in Red Box*) and our fine Silver King Razor out of our regular $3.50 set.

The razor will be mailed in a *cheap paper box*, but it is not a *cheap razor*—the Silver King is as fine as any razor on the market.

We are practically giving you this fine razor to have you try Clark's Secret Temper Blades (*in Red Box*). It's the blade, not the razor, that shaves, but we give YOU a razor you will be proud of.

Send for a trial package to-day. Use them freely. If not satisfactory in every way, don't hesitate to return them and get your money.

Clark Blade & Razor Co., Newark, N. J.

60 Sumner Avenue

Google

Important Books for the Expert or the Student

ELECTRICITY in the Service of Man

is the title of perhaps the largest, most up-to-date, and important library now published on the subject of electricity. Two large octavo volumes are already issued, with over 1,600 illustrations. This is the ONE BIG work upon electricity which you must have no matter what others you already own. It covers every phase of every branch of the subject—provides reading which stirs like romance, and supplies a working library second to none, thoroughly indexed for reference. Each volume complete in itself. As the publishers of the Funk & Wagnalls Standard Dictionary and other important books, our house is noted for reliable works of reference. This library of electricity is edited by an Eminent British authority, R. Mullineux Wamsley, D.Sc. (Principal and head of the Electrical Engineering Dept. of the famous Northampton Institute, London), with the assistance of experts in all the various branches of the science.

Two volumes now ready—One more in preparation.

Vol. I. HISTORY AND PRINCIPLES OF ELECTRICAL SCIENCE.
Vol. II. TECHNOLOGY OF ELECRICITY.

Bound in heavy, durable cloth, large octavo size. $3.00 per volume; by mail, $3.27.

Electrical Distributing Networks and Transmission Lines

By Alfred Hay, D. Sc., M.I.E.E.

A simple and concise account of the theoretical and practical aspects of a subject of great importance to every electrical engineer, but one which has not, perhaps, received as much attention as it deserves. It is hoped that the theoretical portions of the book are sufficiently simple to appeal to the numerous classes of men whose duty it is to maintain conducting networks in efficient working condition. In one or two instances only, and those mainly relating to overhead systems, has the author had recourse to higher mathematics. In all other cases he has aimed at the greatest possible simplicity of treatment.
Strongly bound in cloth, over 100 illustrations. $3.50 net; by mail, $3.65.

Practical Electricity

By W. R. Ayrton, F.R.S., and T. Mather, F.R.S.

NEW EDITION. A complete course for first year students in Electrical Engineering, based on the practical definitions of the electrical units. A great big, thoroughly indexed book of almost 550 pages, with over 300 illustrations.
Strongly bound in cloth. $3.00 net; by mail, $3.19.

Your bookseller will order for you if you show him this ad; or mail your order direct to us and it will have immediate attention.

FUNK & WAGNALLS COMPANY
Electrical Book Dept., 354-60 Fourth Ave., New York

When writing, please mention "M. E. and M."

instrument, the firm manufactures a large line of wireless apparatus, as well as special instruments to order. It will gladly quote prices on any special apparatus upon the receipt of specifications.

A HANDY TELEPHONE ARM

Anyone having occasion to extensively use a desk telephone will find the Equipoise Telephone Arm manufactured by the Holtzer-Cabot Electric Company, Brookline, Mass., unusually handy. This device keeps the telephone out of the way, yet holds the instrument within easy reach at any time. It has several important points that recommend its use, among which are:

No papers or inkstands disturbed or upset since the Equipoise swings over them. No tangled wires because the Equipoise supports the wires. No falling and damaging of instruments since the Equipoise holds the phone securely. No getting up or sitting down in order to speak in the telephone, since the arm will bring the instrument to any desired position. No holding or passing of the receiver—the auxiliary receiver holder being employed to hold the receiver. The Equipoise can be attached anywhere—on either side of a desk or on wall.

There are over 100,000 of these telephone arms in service to-day and they are proving popular in both the office and the home. For full particulars address the manufacturers as above stated.

NAVY EXPENSES FOR THE PAST YEAR

It is learned that the seven naval powers of the world expended $797,948,900 last year in the construction of new vessels. The United States was second in the list, with appropriations aggregating $140,800,643. Great Britain was first, with an expenditure of $235,713,489, while Germany spent $111,270,025. Japan was last, with an expenditure of but $48,105,151.

Great Britain has held her place as the first naval power, with a total tonnage of 2,591,291. Germany now ranks second, with a total tonnage of 1,228,208, while the United States has dropped to third place, with 921,844 tons. France is fourth, with 876,155, and Japan fifth, with 702,099.

Experiments in the use of aspen for shingles show that the shingles do not check in seasoning, and that they turn water satisfactorily, but that they are too easily broken in handling.

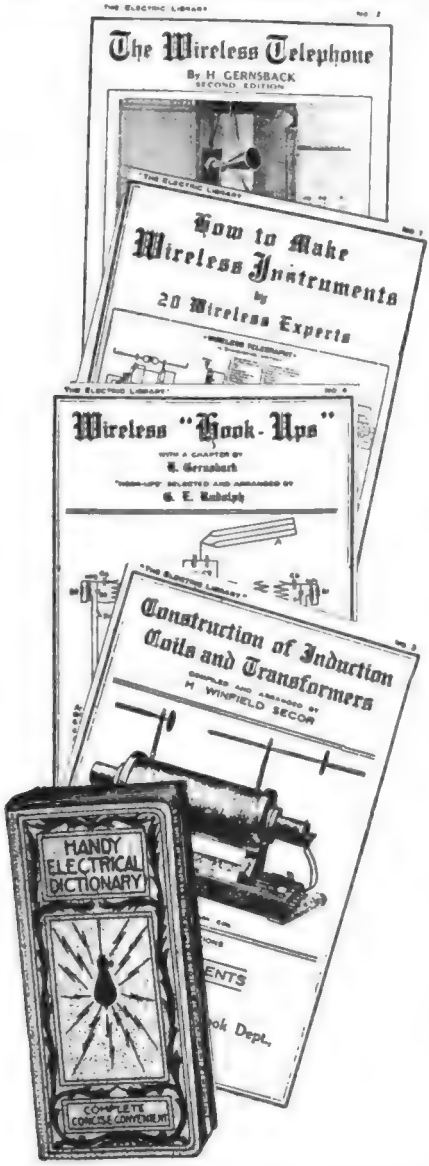
Google

There's Money in Agricultural Blasting

WE TEACH YOU FREE

Our extensive national advertising yields thousands of inquiries from farmers, orchardists, etc., who need blasters to clear land, blast ditches, holes for tree planting, tight subsoils, etc. More than twenty million pounds of agricultural dynamite used in 1913. We refer all inquirers to nearest blaster, supply free advertising matter and help you get the business. We want to start in this independent business, reliable men who have $200 capital for tools, magazine, and running expenses. Write for free booklet No. 422 B.

Agricultural Division, Du Pont Powder Company, Wilmington, Del.



All for One Dollar

The Four Best Handbooks on Wireless and a 224-page Electrical Dictionary

The information contained in these books will enable anyone to construct the most approved Wireless Telegraph and Telephone Apparatus and show you how to operate it with the most efficiency. Look over the contents below and send us a Dollar Bill today.

THE WIRELESS TELEPHONE

80 Pages **By H. GERNSBACH** **57 Illustrations**

Written for the student and experimenter and those engaged in research work in Wireless Telephony. Describes all the present systems and inventions, also contains complete directions for constructing a simple Wireless Telephone. **Price 25c.**

HOW TO MAKE WIRELESS INSTRUMENTS

96 Pages **75 Illustrations**

A treatise by 20 wireless experts for the experimenter and amateur, containing complete directions for making a "Two Mile Wireless Set," also numerous approved Wireless Apparatus for both high and low power sets. **Price 25c.**

WIRELESS HOOK-UPS

96 Pages **By G. E. RUDOLPH** **160 Hook-Ups**

No matter what instruments you have, you will find a perfect hook-up that works in this book. Directions are also given wherever necessary. It will enable you to get better results from your apparatus and to cover much greater ranges. *If you want to get the most efficiency from your station you need this book.* **Price 25c.**

CONSTRUCTION OF INDUCTION COILS AND TRANSFORMERS

96 Pages **By H. W. SECOR** **72 Illustrations**

Describes fully the design and construction of various sized Induction Coils and Transformers. **Price 25c.**

HANDY ELECTRICAL DICTIONARY

Contains definitions of 4800 words, terms and phrases used in the electrical profession, also various circuits and wiring diagrams. Just fits the vest pocket, where it is always ready to assist you in solving any perplexing problem that may come up. **Price 50c.**

SPECIAL OFFER: **All Five Books Prepaid** **$1.00**

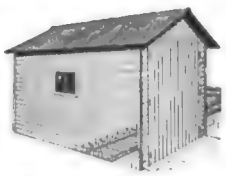
Modern Publishing Co., 231 FULTON STREET NEW YORK CITY

When writing, please mention "Modern Electrics and Mechanics."

Google

Fire-Proof, Ready-Made Garage, $49.50

Genuine "Edwards." Ready-made fire-proof garages. Give protection from rain, snow, fire, thieves and joy riders; save big garage bills. Quickly set up any place. Direct - from - factory prices—$49.50 and up. Postal brings illustrated 64-page catalog.



THE EDWARDS MFG. CO. 747-797 Eggleston Ave., Cincinnati, Ohio

DYNAMOS MOTORS

We are making a specialty of a small, compact, sturdy little generator for charging storage batteries and private lighting plants. Capacity ten-sixteen candle power Tungsten lamps. They are correctly designed, well built, have brush rocker, reaction brush holders, removable bronze bearing shells are shunt wound for voltages of 24 to 50 Machine complete with pulley and field rheostats, $20. Voltages 55 to 110, $22; under 24 volts, $24. A 24-volt storage battery, $26. Send for circular B for other sizes of motors, dynamos, commutators, armature discs and other motor parts.

F. E. AVERILL, 442 Niagara St., Buffalo. N. Y.

Big Entertainer 320 Jokes and Riddles, 153 Parlor Games and Magic, 18 Tricks with Cards, 73 Toasts, 7 Comic Recitations, 3 Monologues, 22 Funny Readings. Also Checkers, Chess, Dominoes, Fox and Geese, 9 Men Morris All 10c. postpaid.

J. C. DORN, 709 So. Dearborn Street, Dept.37 Chicago, Ill.

VACUUM PUMPS

Tools, Hose and Parts

for cleaners at wholesale. Electric or gasoline power. For stationary house or flat machine or wagon outfit. Our pumps rugged, will stand any wear. Assemble your own machine. Saves half. Dept. E.

VACUUM SUPPLY CO., Ann Arbor, Mich.

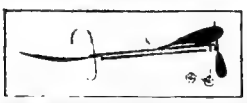
MODEL AEROPLANES

THE WHITE FLYER
You build it.....$1.00
We build it.....$2.25
Postpaid.

Our new Deperdussin model is a winner

Write for free handbook of Models and Supplies

Wading River Mfg. Co., Wading River, N. Y.



DART MONOPLANE

Guaranteed to rise and fly from ground. Prepaid $1. Vertical Flyer 25c.

DART MODEL CO., 40 Fulton St., New York

BOYS! Get a Big BLERIOT MONOPLANE

THAT WILL FLY, given free for selling 12—18K. heavy Gold Filled Scarf Pins at 25 cents each. Send for the pins to-day. When sold return $3.00 and we will send the Monoplane. LENOX NOVELTY CO., 52 Harrison Ave., Jersey City, N. J.

When writing, please mention "M. E. and M."

A NEW TYPE OF TELEPHONE RECEIVER

The recently introduced Grant receiver for wireless telegraphy is attracting considerable attention because of its many unique features. Instead of the usual method of placing the receiver parts in metal cases and mounting them on a headband so that they can fit close to the ears, the Grant receiver has the working parts mounted in a substantial case placed on a table and connected to the operator's ears by means of a flexible tubing. Inasmuch as the moving parts are not limited to any size or weight, as in the case of the usual receivers, it is possible to make them larger and provide suitable means of adjustment.

The Grant receiver is said to be the only instrument on the market to-day that has means for adjusting the magnetic field and permit the operator to set his instrument to any point desired so as to pick up the message in exactly the same tone in which it was sent. With the Grant receiver it is possible to use a head receiving set of very light weight—three ounces—which can be worn for hours without the slightest fatigue. This head receiving set is connected to the receiver by an insulated, flexible tubing, thus preventing any shocks from being experienced through accidental contact with the sending set.

The magnets of this receiver are unusually large and made from the best grade of magnetic metal, thoroughly seasoned so as to insure long life. The coils are wound with a special drawn wire, silk covered, and are treated to remove all air and moisture from them. This is a great factor for permanent maximum efficiency. The receiver case is made from a special compound, moulded in one piece and of very attractive appearance. The price of the Grant receiver is $9.00, complete.

Full particulars regarding this instrument may be obtained by addressing the manufacturers, The Grant Electric Company, 813 Prospect avenue, Cleveland, Ohio.

German pencil manufacturers are looking to California incense cedar for pencil wood. The establishment of a pencil factory in California is not improbable.

Google

BOOK REVIEWS

(*Continued from page* 350)

layman to believe that such a work could be possible. But to one who has had the opportunity of witnessing simple spiritualistic phenomena that were positively known to be devoid of any trickery, such a work seems possible—and wonderful.

"Scientific Proofs of Another Life" comprises a large number of very short essays on topics of everyday life by well-known persons who have passed out of this existence. The opening chapter is in the form of a greeting and appears under the name of Frank Leslie; following are other essays credited to William Ellery Channing, David Crockett, Pontius Pilate, Virginia Dare, Abraham Lincoln, Moses, Napoleon III, G. Garibaldi, Herbert Spencer, U. S. Grant, Charles Darwin, Socrates, George Washington, Sir Isaac Newton, Leon Tolstoy, Daniel Webster, Oliver Wendell Holmes and many others perhaps equally famous.

Even eliminating the fact that the essays are said to be written by departed persons, they are full of interest in themselves and will form agreeable reading for anyone, inasmuch as all the topics are treated in a unique manner that is certainly out of the ordinary. For anyone interested in spiritualism the work is indeed a commendable one.

* *Scientific Proofs of Another Life*, compiled by Rose Levere, LL. B. Published by The Spiritual Science Company, 803 West 137th Street, New York. Contains 231 pages and is profusely illustrated. Cloth bound. Price, $1.00.

ELECTRICAL CIRCUITS AND DIAGRAMS

In this age of higher efficiency, briefness is a paramount requisite in technical literature. While a work must teach and teach thoroughly, the subject must be presented to the reader in the simplest and most expedient manner. In view of this fact, the work entitled "Electrical Circuits and Diagrams,"* second edition, is noteworthy in that it contains wiring diagrams for electrical instruments of all kinds in general use, rendered in the briefest and most comprehensible manner possible. Among the diagrams are those for alarms of all varieties, annunciators, automobiles, bells, generators and motors, gas lighting, storage batteries, street railways, telephones, telegraphs, wireless telegraph apparatus, wiring and testing. A short description accompanies each diagram.

**Electrical Circuits and Diagrams*, by Norman H. Schneider. Published by Spon & Chamberlain, 123 Liberty Street, New York City. Contains 92 pages and 220 diagrams. Paper covered. Price, $0.25.

EFFECTIVE METHODS IN MECHANICAL DRAWING

As its title specifies, "Effective Methods in Mechanical Drawing"* is devoted to the geometry of drafting as well as simple kinks and short cuts that may be employed to facili-

Be Boss

In the New Profession

Thousands of men are needed. The new profession that is **paying big money** wants you and needs you. Here is your opportunity to get into it **now.** You don't need to leave your present employment. Just a few hours a day in your own home and soon you get your diploma and are a full-fledged Meter Engineer.

Be a Meter Engineer

The profession of Meter Engineering is now in its infancy. It is calling for men. The Central Electric Stations **must** have Meter Engineers, because without them they cannot operate. Thousands of positions now open. Wonderful opportunities. You can get into the profession. It is calling **you.**

A $3000 Job for YOU

Meter Engineering is one of the best paying professions in the electrical industry. We can show you hundreds of men who are making better than $3,000 a year. How would you like to have a $3,000 job? Just put your name and address on the free coupon and get full particulars absolutely free. Send it now—**today.**

Special

For a limited time we are making a special reduced price offer in order to induce men to start the study of Meter Engineering right away. Write for full particulars at once.

Send the Coupon and Get 40-Page Book FREE

Do not delay an instant. Just put your name and address on the coupon and mail it to us at once. We will send you absolutely free and postpaid, 40-page book on Meter Engineering. It tells you all about the New Profession and about our school. It tells you how you can learn to become a Meter Engineer in your own home during your spare time. Absolutely no obligations of any kind in getting the book. Just your name and address is enough. But write today—now—immediately while we can still make this great special offer.

Fort Wayne Correspondence School
Dept. 1493
Fort Wayne, Indiana

FREE
Book Coupon

Ft. Wayne Correspondence School Dept. 1493
Fort Wayne, Ind.

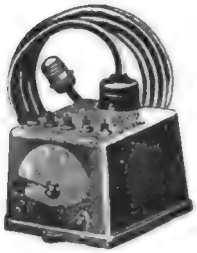
Gentlemen: Please send absolutely free and prepaid your book on Meter Engineering. Also send me full particulars of the great special offer that is now being made to induce men to study Meter Engineering. I assume no obligations of any sort.

Name.....

Address.....

.....

Google



Low Voltage Transformers

Highest efficiency and durability

For operating electrical and mechanical toys.

Work successfully on 110 to 125 volts.

Special Bell Types for ringing door bells, annunciators, indicators, etc. Better than batteries at lower operating expense.

Write today for free descriptive circular. Dealers wanted.

O. J. GOETTMANN, *Manufacturer*
828 East Ohio St., N. S., Pittsburg, Pa.

TRANSFORMERS

FOR BELLS AND TOYS

Lowest Prices ***Highest Efficiency***

Most liberal discounts to dealers. Write for circular.

BRAD-DAR ELECTRIC CO.
408 Bosart Ave. Indianapolis, Ind.

Toy Transformers — Miniature Transformers

DIAMOND TRANSFORMER CO.
215 SECOND AVE. PITTSBURGH PA.

110 Volts to 2-22 in 2 Volt Steps

110 Volts to 6
110 " " 12

THE MODEL ENGINEER AND ELECTRICIAN

Edited by Percival Marshall, A. I. Mech. E.

Published weekly at London, Eng.

The paper which tells you how to make model locomotives, steam and gas engines, aeroplanes, motor cycles, boats, dynamos, motors, coils, batteries, wireless apparatus, and everything mechanical and electrical. Just the paper for the man or boy with a workshop. It is written by experts, and is read by scientific amateurs and professional mechanics and electricians all over the world. It has thirteen years' reputation for high-grade instruction in the theory and practice of small power engineering.

Every issue is fully illustrated.

Single copies 8 cents. Annual subscription three dollars postpaid.

Sole Agents for U. S. A. and Canada.

SPON & CHAMBERLAIN
123G Liberty Street
NEW YORK

When writing, please mention "M. E. and M."

tate drawings. The work represents the experience of the author covering a period of over ten years and the solutions given are those that have been arrived at after giving each problem many hours of diligent study. The unique feature of the book is that the explanations are given by drawings, accompanied by the briefest possible description consistent with clearness. This work* is essentially a reprint of selected sections of "The Drafting Room Series," which was reviewed in the February issue of MODERN ELECTRICS AND MECHANICS.

* *Effective Methods in Mechanical Drawing*, by Frederick H. Evans, M. E. Published by The Manual Arts Press, Peoria, Ill. Contains 44 pages and 22 illustrations. Cloth bound. Price, $0.50.

ELECTRIC LIGHT AND POWER WIRING

Under the title of "Standard Wiring for Electric Light and Power,"* a work has been prepared setting forth the requirements of various forms of wiring as approved by the Fire Underwriters. The book covers wiring in all its branches, such as for motors and generators, and inside and outside work. A list of approved wiring supplies is also included as well as numerous tables and formulæ. A section is devoted to treatment for electrical injuries.

"Standard Wiring for Electric Light and Power" has been written with a view to standardizing electrical work so that it will meet with the regulations of the National Electrical Code. It should be in the possession of all who are engaged in electrical construction work.

* *Standard Wiring for Electric Light and Power*, by H. C. Cushing, Jr. Published by H. C. Cushing, Jr., Pulitzer Bldg., New York City. Leather covered. Price, $1.00.

LIST OF RADIO STATIONS

The Department of Commerce has recently issued "Supplement No. 1" to the list of Radio Stations of the United States, Edition of July 1st, 1913, covering all additions and alterations up to October 1st, 1913. The new supplement contains 27 pages and may be secured by addressing Superintendent of Documents, Government Printing Office, Washington, D C., at ten cents per copy.

HOW TO MAKE AND USE A WIRELESS STATION

An instructive little book describing the building and operation of a wireless station has recently been published under the name of "How to Make and Use a Wireless Station."* This work describes the principles involved in wireless transmission and reception, the construction of the aerial, the securing of a good ground, arrangement of the transmitting and receiving set, as well as a short summary of the wireless law.

Of course, in this work the subject is somewhat hastily covered. But, for anyone desirous of securing a general knowledge of wire-

Google

More Vital Energy For You

MAGNETIC SHIELDS fill the system with **MAGNETIC FORCE**, which does what all the medicine on earth cannot do. It gives life, energy and tone to the blood and nerves. **MAKING THE BLOOD CIRCULATE VIGOROUSLY**, overcoming congestion, soreness and pain.

We Prove it to You Positively

Not in one case, or a dozen cases, but in multitudes of cases where people say they have been cured of Paralysis, Rheumatism, Lung Trouble, Kidney, Liver, Stomach and Bowel Troubles, nervousness and most every other form of disease after medicine failed.

Our **Magnetic Abdominal and Kidney Vitalizer** for ladies and gentlemen, here illustrated, is only one of the many shields we make. **It is a Wonderful Invention,** scientifically constructed and floods the system with magnetism, supplying **Life, Strength and Vigor** to the **Back, Kidneys, Stomach, Liver, Bowels and Bladder,** giving that buoyancy, tone and renewed vitality to the system that Magnetic force alone can supply.

FEED YOUR SYSTEM WITH MAGNETIC FORCE

Write today for full information and free book, **"Plain Road to Health,"** by C. I. Thacher, M. D. Describe your case fully, we advise you free how to apply **Magnetism** for treating any form of weakness or disease.

THACHER MAGNETIC SHIELD CO., Inc., Suite 564, 110 South Wabash Avenue, CHICAGO, ILL.

BOY ELECTRICS

The KNAPP LEADER—The Best

PRICE **$2.50**

Guaranteed as Represented

Many other motors at all prices.
Live dealers everywhere.
Order direct or ask your dealer to show you the Knapp line and insist on getting Knapp goods.
Dealers not already handling the Knapp line should ask for prices.
Catalogue illustrating full line of dynamos, motors and electrical novelties free on request.

Knapp Electric & Novelty Co. 517 West 51st St. NEW YORK

WE CARRY A STOCK OF

KNAPP GOODS

LEVY ELECTRIC CO.

839 Market Street - San Francisco, Calif

K. & D. Measuring Instruments

Voltmeter, No. 22, Ammeter, No. 20, Price, $2.00

Our measuring instruments are inexpensive but well made and designed for practical work.

For sale by all dealers, or will be sent express prepaid upon receipt of $2.25. Send for our catalog No. 9-A. of high grade battery motors and small dynamos. All dealers should write for catalog and prices of our line.

KENDRICK & DAVIS CO.

Manufacturers

Lebanon New Hampshire

36278 $150.
36034 $45.
20%-10%
DOWN MONTHLY
DIAMONDS ON CREDIT
SAVE money on your diamonds, watches and jewelry by buying from our new Catalogue de luxe, which explains our easy payment system. We are Importers and guarantee you every advantage in price and quality. 20% DOWN and 10% MONTHLY. Guarantee certificate with each diamond. Full credit allowed on exchange. Transactions strictly confidential. Write today for Catalogue Number 27
L. W. SWEET & CO. 2 and 4 MAIDEN LANE NEW YORK CITY
36030 $25.
36184 $100.
36055 $300.
36211 $90.
36080 $100.
36043 $100.
36254 $50.
36226 $25.
36071 $55.

When writing, please mention "Modern Electrics and Mechanics."

Digitized by Google

Have you a sign like this on your door?

PLEASE KNOCK,
BELL OUT OF ORDER

The chances are that the bell is O.K., but you are simply having BATTERY TROUBLE—AGAIN!

A Viking Bell Ringer

Installed in place of your batteries will do away with your bell troubles for ALL TIME.

IT LASTS FOREVER.—No moving parts inside to wear out. Ask your dealer about it.

GET A VIKING TOY TRANSFORMER

for your boy—useful and instructive. Full information on request. ADDRESS DEPT. C.

Viking Electric Company, Inc.

VIKING PRODUCTS

152 Chambers Street
New York, N.Y.

HOUSE OF ELECTRICAL NOVELTIES

Famous "FRANCO"
Flashlights, Batteries
and Miniature Lamps

The above illustrates our Pistol Flash-Light—A Favorite

Complete with Tungsten Lamp and Battery . . $1.50
AT YOUR DEALERS

Interstate Electric Novelty Co.

New York
90 Park Place
Chicago
306 S. 5th Ave.
San Francisco
111 New Montgomery St.

less telegraphy, the book will be found quite valuable. It is intended to interest the reader in reading a more advanced work, entitled "Experimental Wireless Stations," by the same author.

* *How to Make and Use a Wireless Station*, by Philip E. Edelman. Published by Philip E. Edelman, 2432 Lyndale So., Minneapolis, Minn. Contains 8 pages and is profusely illustrated. Paper covered. Price, $0.10.

ELECTRICAL SAFETY DEVICES

A most interesting work has been published under the name of "Fuses, Circuit Breakers and Other Electrical Safety Devices,"* which, as indicated by its title, discusses the various forms of electrical protective devices in general use to-day. Among the topics covered by the book are fuses, circuit breakers, lightning arresters, regulators, etc.

The work will prove of interest to anyone specializing in central station work, but it will also be useful to the practical electrician who desires to secure detailed information regarding protective devices.

* *Fuses, Circuit Breakers and other Electrical Safety Devices*, by James C. Peebles. Published by The Joseph G. Branch Publishing Co., Chicago, Ill. Contains 55 pages and 19 illustrations. Paper covered. Price, $0.50.

MODERN INDUSTRIAL AND MILITARY EXPLOSIVES

(*Continued from page 293*)

intended. As first devised in 1891, this explosive consisted of:

Nitro-glycerine .....58 parts
Guncotton .....37 parts
Mineral jelly (vaseline)..... 5 parts

This powder gave to projectiles, at half the weight, the same velocity as Poudre B, but the erosion of the gun was very great, and in 1898 a modification was made in the composition of cordite, and at the present time its composition is:

Nitro-glycerine .....30 parts
Guncotton .....65 parts
Mineral jelly..... 5 parts

The advantages of this last named explosive, known as Cordite M. D., are: slightly reduced rate of burning, higher velocities, more regular pressure in the gun and lower temperature, consequently less erosion.

Cordite is a waterproof substance and shows considerable elasticity. Its density is about 1.56. Ignited in the air, it burns with a yellowish flame.

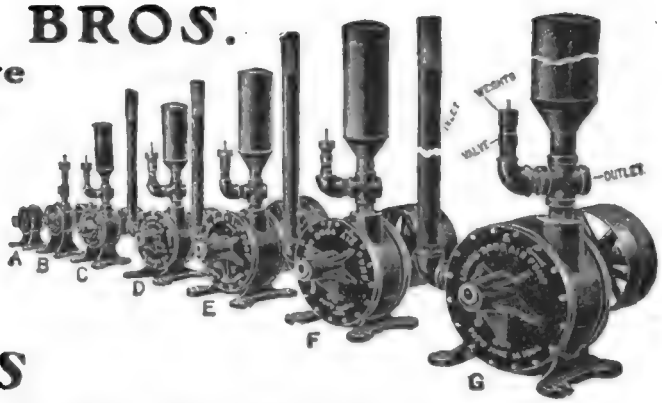
The smokeless powders at present known can be divided into three classes:

1. Powders in which guncotton, either the so-called insoluble or the soluble variety, alone is used, which, by

Google

LEIMAN BROS.

Rotary Positive High Pressure



BLOWERS and VACUUM PUMPS

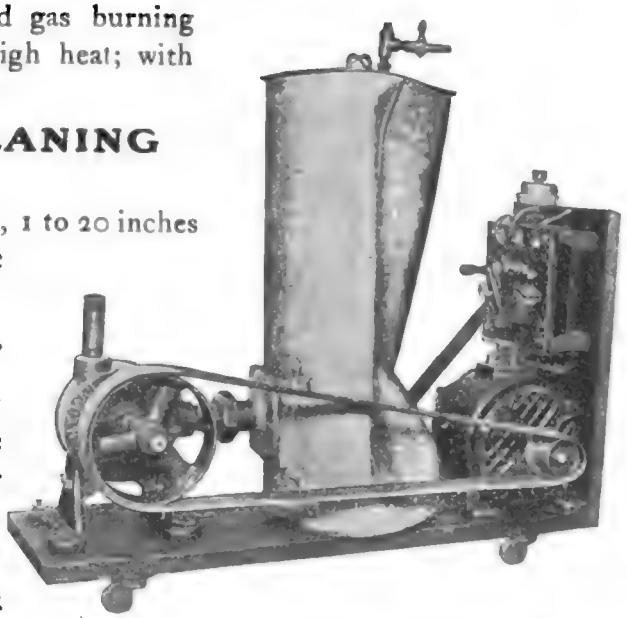
for use with oil, coal and gas burning appliances for obtaining high heat; with sand blasts, gas producers,

VACUUM CLEANING

and every other purpose.

1 oz. to 10 lbs. pressure, 1 to 20 inches vacuum, 2 to 338 cubic feet per minute.

This shows what our small machines do



The machines do many things with air which were formerly done by hand or mechanically.

LEIMAN BROS.
62 John St., New York

NEW
6 VOLT 8 AMPERE GENERATOR

FOR **AUTOMOBILE**
MOTORCYCLE
MOTORBOAT and all
MINIATURE LIGHTING

IT IS A WONDER

The Carleton Company also Motors and Fans No Toys 172 Summer Boston

ELECTRICITY

This is your "elbow book." It's the latest edition of the Voltamp Electric Catalog—128 pages full of cuts, complete description and prices of latest experimental apparatus—Dynamos, Motors, Rheostats, Transformers, Wireless Coils—Electrical Repair Material; Telephone, Telegraph and Wireless Outfits; Raw Materials; Handbooks; Miniature Electric Railways and parts, Toys, etc. 5c in stamps or coin will bring you this book (with valuable coupon) —you'll find it worth DOLLARS. (No postals answered.
VOLTAMP ELECTRIC MFG. CO., Wits Bldg., Baltimore, Md.

Electric Flashlight Pistol

Complete with **two** batteries and tungsten light. Gun metal finish, handy to carry, never in the way. Size 3x3½. It's no toy but a neat, handy flashlight. Protect yourself in the dark.
Price, prepaid, $1.60.
SEND FOR CIRCULAR
MOHR BROS., 2810 N. Halsted St., CHICAGO

Google

aid of a solvent, has been converted into a horny substance and then is formed into flakes or cords.

2. Powders in which a mixture of nitro-glycerine and either di- or tri-nitro-cellulose is transformed into a similar horn-like substance, either with or without the aid of a solvent.

3. Powders which contain nitro derivatives of the aromatic hydro-carbons, either by themselves or in connection with nitro-cellulose.

Smokeless powder as used in the United States Navy is essentially a nitro-cellulose powder, consisting of a mixture of insoluble and soluble nitro-cellulose, to which is added the nitrate of barium and potassium and a very small percentage of calcium carbonate.

The proportion of these ingredients in case of the six-inch rapid firing gun is as follows:

Mixed nitro-cellulose (insoluble and soluble).....80 parts
Barium nitrate.....15 parts
Potassium nitrate..... 4 parts
Calcium carbonate..... 1 part

The mean nitration strength of the mixture must show 12.75 per cent. of nitrogen. The solvent used in making the powder consists of a mixture of

Ethylic ether (specific gravity 0.720) ..... 2 parts
Ethylic alcohol (95 per cent. absolute by volume)..... 1 part

This powder produces a little smoke and some bore deposit.

The United States, France and Russia use exclusively nitro-cellulose powders; while England, Italy, Sweden and Japan use powders consisting of a mixture of nitro-glycerin and nitro-cellulose. Germany, the only country which has studied these two powders systematically, uses the first mentioned in their small calibre guns, the last named in their large calibre guns.

In the case of the old gunpowder, the most dangerous manufacturing operation was incorporation. With the modern colloid propellants, the most dangerous operations are the chemical processes in the preparation of nitro-glycerin, the drying of guncotton, etc. After the gelatinized solvent has been added, all the mechanical operations can be conducted practically with perfect safety.

However, black powder, a mineral mixture, may be kept for centuries without any appreciable change in its chemical composition. But smokeless powders in time will decompose and if enough heat is accumulated by this decomposition, a spontaneous combustion with all its dangers may result. There are three factors which hasten this decomposition: Variations in the temperature, humidity and the presence of an excess of the solvent. To retard the decomposition, stabilisators, which absorb the vapors produced by the acids, are used. The one in general use is the German stabilisator, the "diphenylamine."

To conclude, let us cite once more the different explosives actually employed at the present time.

1. Mixtures, the ingredients of which may be non-explosives, (gunpowder and some chlorate compositions).

2. Compounds, used singly, as guncotton or nitro-glycerin (in the form of dynamite).

3. Picric acid (lyddite or melinite).

4. Mercury fulminate and other fulminates.

5. Combinations of some explosive compounds (cordite and the smokeless propellants in general use for military purposes).

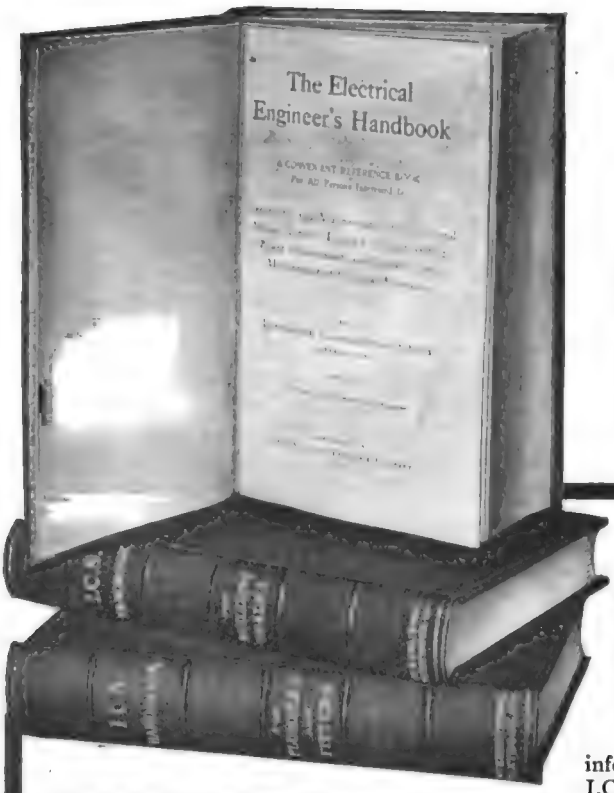
6. Blasting and detonating or igniting compositions.

METHODS OF BLASTING.

Since the advent of black powder, the most common method of setting off a charge of this explosive was by the use of a fuze that was ignited and burned slowly so as to enable the workmen to retire to a safe distance before the explosion took place. Fuzes of this kind are still used for many purposes but electrical blasting is now recognized as the safest method.

In blasting a charge of black powder by means of a fuze it is only necessary to insert one end of the fuze into the charge and ignite the other end. However, with explosives that require detonation, it is necessary to fasten a blasting cap at one end of the fuze and insert it in the charge. In the latter case, when the spark of the fuze reaches the blasting cap, an explosion takes place which imparts the necessary shock or detonation to the charge which then deflagrates violently. Fuzes are obtained in many diversified brands for employment in different kinds of blasting. Fuzes may be

Google



22 Handbooks of Practical Information

WHEN the boss asks a puzzling question—when an unusual piece of work comes along—THEN it pays to be able to put your finger on the exact rule, formula, or bit of information that holds the key to the situation. For it's at these critical moments that the boss finds out who is "onto his job"—who is in line for promotion.

No books in existence contain as much information in so small space as these I.C.S. Handbooks. One book is devoted to each trade or profession. They contain all the rules, formulas, and other data that you've got to have right off the bat. They are thoroughly indexed—any desired information can be located instantly. They have been compiled from the "Easy to Learn, Remember, and Apply Home-Study Courses" of the International Correspondence Schools. Every fact and formula is clearly stated. They are indispensable helps to quicker and better work. Bound in silk cloth they retail regularly for $1.25 each.

Mechanics': Tables; formulas; measurements; belting; mechanical powers; hydromechanics; specific gravity; strength of materials; shafting; boiler design; care of boilers; power of boilers; chimneys; exhaust heating; machine design; machine tools; slide valve; pulleys; horsepower; cylinders and steam chests; pistons; gearing; dynamos and motors; batteries; transit surveying; curves; radii and deflections; earthwork; trackwork; etc. Contains 330 pages and 174 illustrations.

Electrical Engineers': Tables; chemistry; mechanics; electricity; electrical units, symbols and quantities; physical and electrical properties of metals and alloys; wire gauges; magnetism; dynamos and motors; armature winding; electrical batteries; alternating current apparatus; alternators; transformers; wattmeters; transmission; electric lamps; wiring; electric heating and welding; electromagnets; controllers; car wiring; etc. Contains 414 pages and 238 illustrations.

Chemists': Definitions and fundamental laws; atomic weights; pressure; volume and temperature of gases; weights and measures; specific gravity; hydrochloric-acid, nitric-acid, and sulphuric-acid solutions; solubilities of chemical compounds; heat measurement; qualitative analysis; special tests of acids; general table for analysis; classification of rare metals; the spectroscope; nitrogen; blowpiping; determination of gold and silver ores; methods of assaying; composition of alloys; tables; antidotes of poisons, etc. Contains 332 pages and 11 illustrations.

Other Handbooks Now Ready

Automobile
Air Brake
Civil Engineer's
Steam Engineer's
Telegraph and Telephone Engineers'
Mariners'
Coal Miner's
Concrete Engineer's
Building Trades
Plumbers and Fitters'
Poultryman's
Farmers
Textile Worker's
Business Man's
Bookkeeper's
Stenographers and Corres.
Salesman's
Advertiser's
Window Trimmer's

International Textbook Co.
Box 992, Scranton, Pa.

Special Offer

For a limited time we will sell these regular $1.25 Handbooks, durably bound in silk cloth in a convenient pocket size, at a price for each Handbook of only—

50c

TEAR OFF HERE

International Textbook Co., Box 992, Scranton, Pa.

Enclosed find $ ____ for the following I.C.S. Handbooks ____

Name ____ St. & No. ____ Town ____ State ____

Google

IMPROVED DETECTOR

ENDORSED BY COMMERCIAL WIRELESS OPERATORS

We make wireless apparatus to order.

Estimates cheerfully furnished.

Tell us your requirements.

Triple Adjustment. Mechanically and Electrically Perfect. A great favorite among operators everywhere.

POSTPAID

$2.00

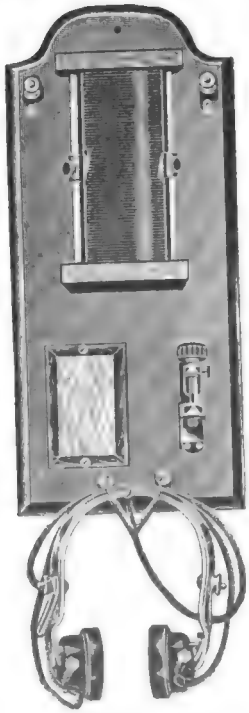
This detector has a genuine hard rubber base—not composition. All the parts are of brass, attractively and durably nickel-plated. Tension at the point of contact can be instantly varied by a simple turn of knurled rubber knob. Post is pivoted and cup is rotatable so as to enable every portion of crystal to be reached. Postpaid, $2.00.

A. H. Grebe & Company

10 VAN WYCK AVE.

RICHMOND HILL, N. Y.

THE COSMOPHONE



Comprising Double Slide Close Coupling Tuning Coil — 800 meters wave length may be easily tuned in connection with an average size aerial —Crystal Detector with adjustable ball join, enabling to contact with every spot of the mineral. Fixed Condenser of high di-electric strength, and Terminals for Aerial and Ground and also for the Receiver.

Complete Instrument on finished cherry wall board, with One set of double headband 2000 Ohm Receivers, **regular price $11.50. this month $9.50.** Same **with one** 1000 Ohm Receivers, including cord, **regular price $7.50 this month $6.35.** All Literature free with order, otherwise **5 cents** requested and credited on first order.

COSMOS ELEC. CO,

136 M Liberty St., New York

When writing, please mention "M. E. and M."

obtained for either dry or wet work and from fast to slow in action.

The many disadvantages of firing blasts by means of fuzes have caused the introduction of electric blasting in which an electric current fires the charge. For firing black powder or a similar explosive that requires heat to bring about the explosion, an electrical device known as the "electric squib" is employed. The electric squib consists of a heavy paper cap containing a charge of powder. When the electric current passes through the fine wire contained in the electric squib, a flame spouts out from one end, causing the main charge of powder to be ignited. For blasting by means of the high explosives such as dynamite, blasting gelatin and others requiring detonation, an electric fuze similar to that shown in one of the accompanying illustrations is employed. It consists of a shell of copper, A; a chamber containing the explosive charge, B; the insulated copper wires entering the cap, C; the bare ends of the copper wires, D, that project into the charge; the small platinum wire, E, or "bridge," soldered to and connecting the two ends of the copper wires, which is heated by the electric current; the composition plug holding the fuze wires firmly in place, F; and the filling material, G. When the electric current passes through such a fuze, the platinum wire becomes heated and ignites the charge which in turn explodes violently and imparts the necessary detonation to cause the explosion of the dynamite or other explosive.

The foregoing mentioned electric fuzes may be operated from any source of electric current, but the most popular method now in use is the employment of a small portable generator that can be operated by either pushing, pulling or turning a crank. This generator will furnish current to several electric fuzes at the same time so as to cause the simultaneous blasting of many bore holes at a time.

Aside from the electric fuzes previously mentioned which cause the explosion of the charge the moment the electric current is sent through them, there are other electric fuzes that will not explode the charge immediately. These are known as "delay electric fuzes."

Electro magnets are being installed by treasure hunting ships for the recovery of submerged hulls and their contents.

Google

ELECTRICAL EQUIPMENT OF THE PANAMA CANAL

(*Continued from page 348*)

the lamps that illuminate the scales of indicators. The receivers, transmitters and lamps are operated at 110 volts, while the control circuits are 220 volts, both using 25-cycle alternating currents.

MECHANICAL INTERLOCKING SYSTEM

In order to make it necessary for the operator to maneuver the control switch handles always in a certain order, corresponding to a predetermined sequence of operation of the lock machinery, and to prevent the operator in control of one channel from interfering with the machinery under the jurisdiction of the operator controlling the other channel, these control switches are provided with interlocks. The interlocks are in two vertical racks under each edge of the board and some distance below, so that they may be inspected and oiled from a floor which is about seven feet below the floor on which the switchboard operator stands. The latter floor does not extend across under the board, this space being open so that all parts on the underside of the board are accessible from the floor below.

Vertical shafts operated by connecting rods from the control switch shafts extend downward past the electrical parts for the operation of the interlocks.

SPECIAL CLIMATIC REQUIREMENTS

To withstand the humid atmosphere of the isthmus, every insulated part, such as solenoid, relay, circuit breaker, and other coils, was impregnated with non-hygroscopic compounds. All small parts were made either of brass, copper, Monel metal, bronze, or of sherardized iron or steel. Mica and treated asbestos lumber were used largely in place of fibre or wood.

There is promise of a large turpentine industry in the west and southwest, the raw product being supplied by the resinous gum of western yellow pine.

When a man celebrates his birthday he takes a day off. When a woman experiences a similar happening she takes a year off—from her age.

Let this Coupon bring you HEALTH!

Tear it out—mail it to us—so we can give you our latest book, telling in detail of the curative powers of this modern, scientific health restorer.

Oxydonor TRADE MARK

We care not what your particular disease is called! Providing no vital organ has been impaired, Oxydonor is the way to perfect health. For all forms of disease are due to physical weakness—lack of vitality; and Oxydonor revitalizes the entire system, by satisfying the body's natural—but stinted—demand for Oxygen.

Our Guarantee

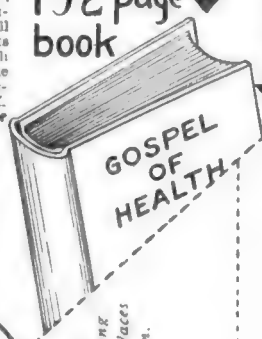
Oxydonor, with full directions, will be

Sent on 90 Day Trial

If not entirely satisfied with results at end of that time, the purchase price will be refunded.

What Oxydonor has done for thousands it should do for You. Take your first step towards Health to-day! Beware of fraudulent Imitations. All genuine instruments are stamped with the name of the Inventor and Discoverer—Dr. H. Sanche. Look for this name.

192 page book



Please send me your Free Booklet describing the Oxydonor. This places me under no obligation.

NAME.....

ADDRESS.....

DR. H. SANCHE & CO., Inc.

Dept. 23, 489 Fifth Ave., New York City

When writing, please mention "M. E. and M."

Google

Wireless Telegraph Contest

The Wireless Station and Laboratory contest is a regular monthly feature. The best photograph submitted each month is awarded a first prize of Three Dollars; second best, Two Dollars; third best, One Dollar.

The description of a station should not exceed 250 words. Write on one side of the paper only, using as many separate sheets as are necessary. Descriptions should be written in ink—not pencil. Typewritten descriptions using double spacing are preferable to any. It is advisable to send two prints of the photograph whenever possible—one toned dark and the other light—in order to permit of choosing the one best adapted for reproduction. Prints should be sharp and distinct.

This competition is open to all, irrespective of whether they are subscribers or not.

FIRST PRIZE

Herewith is a time exposure of my wireless station, which is the outcome of several years' work along this line.

My aerial is composed of four strands

WIRELESS STATION OF H. B. ELVERSON

of aluminum wire, each a hundred feet long, and about fifty feet from the ground

The transmitting set consists of a 1-inch spark coil, zinc gap, and a glass plate condenser. Power is furnished by either dry cells or a dynamo.

The receiving set comprises a loose coupler, silicon, and perikon detectors, fixed and variable condensers, H. C. 2,000-ohm receivers, and the usual buzzer test. A "United" type change-over switch is employed.

The instruments are all of my own construction with the exception of the receivers, spark coil, and dynamo.

In addition to the wireless set, I have other pieces of experimental electrical apparatus, including a small spark coil, Geissler tubes, two electric engines, five small motors, ammeter, magneto, bells, lamps, buzzers, a miniature telephone to a neighbor's, and a line telegraph which is part of a system that connects with six other amateurs within a radius of two blocks.—*Harold B. Elverson, Camden, N. J.*

SECOND PRIZE

I am presenting herewith a photograph of my wireless station which I wish to enter in the Wireless Contest.

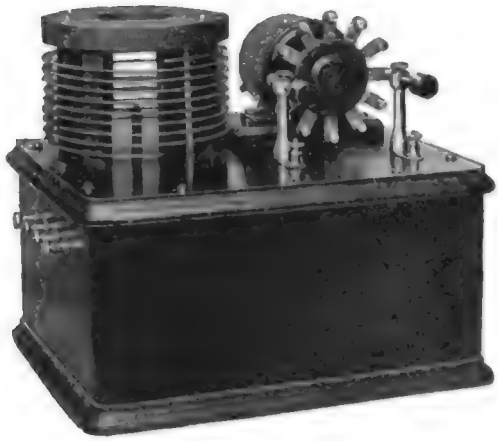
My station is situated at the foot of a large hill, but nevertheless I have had very good results, having heard NAR, and other stations nearly as far.

My aerial is about 100 feet long and 60 feet high, and is stretched between six-foot bamboo spreaders. I am using aluminum wire for my aerial at present, but hope to have a stranded phosphor bronze wire aerial before long.

My receiving set consists of the following: Loose-coupler, "Blitzen" variable condenser, galena and universal detector, and a pair of Brandes' Superior phones. I find galena very sensitive, but very difficult to keep in adjustment.

My sending apparatus consists of: A 5-kw. closed-core transformer, an os-

Google



MURDOCK APPARATUS

CONSISTENTLY AND PERMANENTLY GOOD

In the laboratory of the up-to-date school or college, or in the station of the wise amateur, the MURDOCK 1 KW Set is the IDEAL transmitting unit. Its splendid appearance, its excellent materials, its faultless operation, all guarantee positive satisfaction.

Imagine this set "hooked up" in YOUR station. You throw your aerial switch into sending position. The gap motor starts its steady whirl. You press the key. Listen to the crisp, clear-cut spark. Note the high radiation on your meter. Realize that your signals are singing out into space with unmistakable clearness and vigor. And, finally, understand that your wave complies with every requirement of the Radio Law. It's GOOD to think about: it's BETTER to do.

You need this MURDOCK set, if you really want the best. The price is $100, complete.

SEPARATE INSTRUMENTS

An amateur station without some MURDOCK APPARATUS as an important factor in its success is an incomplete station. Out of the MURDOCK line, you may choose the instrument to replace that inefficient part of your set,—or you may add the one that you have been waiting to get. Your station needs some MURDOCK APPARATUS. Get it NOW.

EXCLUSIVELY OURS

Condenser No. 483, the strongest and most efficient transmitting condenser made for amateurs: Series Condenser No. 487, for reducing open circuit wave length: Variable Condenser No. 365, the biggest capacity in the smallest space: Silicon Detector No. 322, the best all 'round detector in use: and above all, the reliable MURDOCK 'phones.

Every amateur interested in serviceable, efficient, and reliable apparatus ought to have a copy of our Catalog No. 12, for his better knowledge of the GOOD apparatus which is obtainable at FAIR prices. Get YOUR request for a copy off TODAY.

WM. J. MURDOCK CO.
40 Carter St.,
CHELSEA, - - - MASS.
680 Howard St., San Francisco

Murdock Apparatus is sold by J. J. Duck Co.
432-434 St. Clair St., Toledo, Ohio.

Google

WIRELESS
RAILROAD - COMMERCIAL
TELEGRAPHY

An Institution with 15 years of success. A complete course at a low rate of tuition. Our new $4,000 Wireless Station complete.

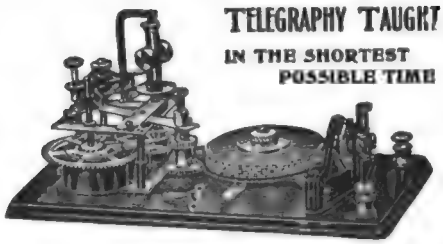
ALL GRADUATES PLACED IN POSITIONS.

CLASSES FORM MONTHLY
Open all Summer. Write for Catalogue

"You Know Us—Let Us Know You"

Correspondent Course
BOSTON SCHOOL OF TELEGRAPHY
18 Boylston Street Boston, Mass.

TELEGRAPHY TAUGHT
IN THE SHORTEST POSSIBLE TIME



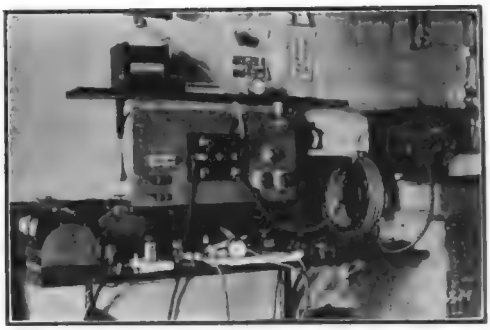
The Omnigraph Automatic Transmitter combined with standard key and sounder. Sends your telegraph messages at any speed just as an expert operator would. Five styles $3 up. Circular free.
Omnigraph Mfg. Co., 39½ Cortlandt St., New York

LEARN TELEGRAPHY
Morse or Wireless. Also superior station agency course. Splendid opportunities. Demand greater than supply. Graduates assisted. We own and exclusively occupy two large modern buildings equipped with B. R. and Western Union Wires and complete $3,000 Marconi Wireless Station. Oldest and largest school—est. 30 years. Investment $35,000. Endorsed by Railroad, Wireless and Western Union Officials. Expert practical teachers. Living expenses may be earned. Tuition low. Easy payments. Catalogs Free.
Dodge's Telegraph Railway & Wireless Institute
7th Street Valparaiso, Ind.

LEARN TELEGRAPHY FREE
We teach you by mail, Wireless, Commercial and Railroad Telegraphy. Our course costs you nothing.
Write to-day for free booklet containing full details.
BROOKLYN TELEGRAPH SCHOOL
W. U. Telegraph B'ld'g. 313 Fulton St., Brooklyn, N. Y
Largest Telegraph School in the U. S.

When writing, please mention "M. E. and M."

cillation transformer, a rotary spark gap, and a condenser of the glass plate type made from heavy tin foil and ordinary window glass. I use a high frequency



WIRELESS STATION OF WM. S. GRAVES

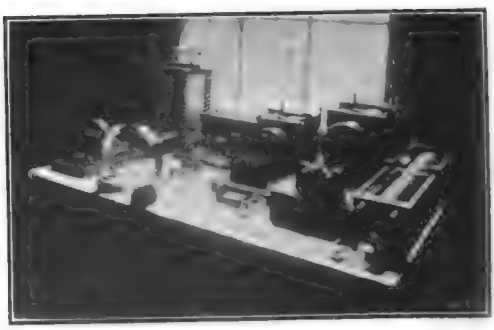
buzzer for sending around town. I made the buzzer from a description in a recent issue of MODERN ELECTRICS.—*Wm. S. Graves, Sunapee, N. H.*

THIRD PRIZE

The accompanying view shows the apparatus comprising my wireless station.

The sending set consists of a one-inch spark coil, a zinc spark gap with cooling flanges, a helix, glass-plate condenser, and a wireless key. I use an aerial and lightning switch.

For receiving I use a small and large loose-coupler in connection with a triple-pole switch, which allows me to use either loose-coupler I have a 2,000-



WIRELESS STATION OF I. WEINSTOCK

ohm set of Brandes' receivers, a fixed condenser, the usual buzzer test, and employ perikon, silicon, and galena detectors with the necessary switch. I use a

Google

The New Home OF The Barrett's School of Telegraphy

Commercial, Wireless and Railroad Telegraphy

DAY AND EVENING CLASSES

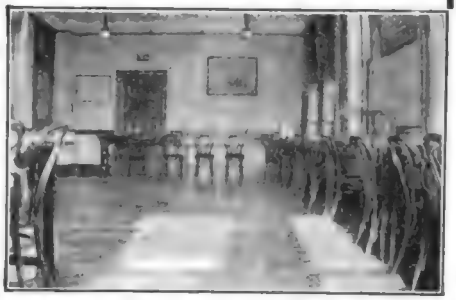
Students Prepared for Government Examinations

We Graduate Expert Operators

The demand for competent men and women operators is increasing daily in the wireless and commercial field. We prepare students, both male and female to take the government examination in the shortest possible time. Our students are now with the Telefunken and Marconi Wireless Companies and the big telegraph companies. If considering taking up the study of telegraphy in any of its branches, take advantage of our invitation to inspect our school at your leisure.

CENTRAL UNION GAS CO. BUILDING

519-527 Courtlandt Ave. Tel. 1107 Melrose **New York City**



THE BEST *EVENING* COURSE IN WIRELESS IN NEW YORK

If you live nearby and wish to hold your present position, while studying at night. Complete equipment—twelve instructors.

Prepare for a government license—under a Marconi Engineer

Day Courses in Operating and Construction

Evening Courses in Engineering, Operating, and Drafting

Spanish for Operators

New class in Engineering starts soon.

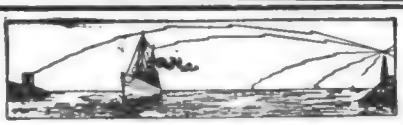
Y. M. C. A. TELEGRAPH SCHOOL, 148 East 86th St., New York

Boy Electrician with 75 illustrations for making Batteries, Dynamos, Motors, Telegraph apparatus, Telephone, Lights, Bells, Alarms, Coils, "Wireless" Current Reverser, Electric Engine, Etc. By Electrical Experts so that anyone can understand it. With Cat. All **10c Ppd.**

J. C. Dorn, 705 S. Dearborn St., Dept. 48, Chicago, Ills.

WIRELESS MANUAL AND CATALOG C OF ELECTRICAL SUPPLIES AND NOVELTIES FREE

DAVID KILLOCH CO. Dept. C 57 Murray St., N. Y.



Learn Wireless, Railroad, and commercial telegraphy; classes day and evening; latest wireless apparatus used; pupils receive wireless messages from ships and stations many miles away. Write or call for descriptive matter, terms and bulletin giving positions held by our graduates.

The PAINE Uptown BUSINESS SCHOOL

Box A" 1931 Broadway, near 65th St., New York City

As a Marconi wireless operator you will have a chance to visit all the important and interesting places in South America, in Europe and elsewhere

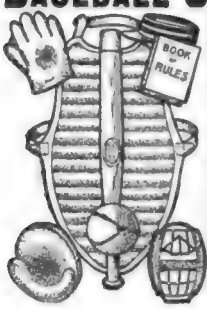
See The World and Get Paid For Doing It

You can readily train yourself to become a wireless operator at our school. Working every day with actual Marconi instruments, the course is fascinating and as soon as you have finished and obtained a government license we assure you of a good position.

Join the next class—beginning now. Write at once for full information and rates. Don't delay.

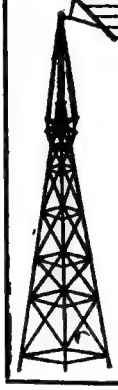
MARCONI WIRELESS TELEGRAPH SCHOOL OF INSTRUCTION, 1120 PROSPECT AVE. CLEVELAND, OHIO.

BASEBALL OUTFIT FREE



BOYS! Here is your chance to get a fine baseball outfit, consisting of complete suit, including shirt, pants, cap and belt, good quality, extra well sewed, or combination of big catcher's mitt, fielder's glove, catcher's mask (extra strong and durable) and rubber center ball, big league style, or fine chest protector. **Will Not Cost One Cent.** Send your name and we will send you 8 set of our fine pictures to dispose of at 25 cents each. Send us the $2 you collect and for your trouble will send you outfit as described. **WRITE TODAY** for pictures. No harm done. I take back what you can't sell.
M. O. Seitz, 3 M. 180 Chicago

Wireless SEE THE WORLD



Our Operators are with the

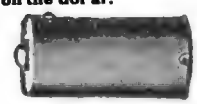
MARCONI WIRELESS COMPANY
UNITED FRUIT COMPANY
U. S. GOVERNMENT

Wireless, Railroad and Commercial telegraphy. Day and Evening. Low monthly rates.

PHILADELPHIA SCHOOL OF WIRELESS TELEGRAPHY
10th FLOOR, PARKWAY BUILDING
BROAD and CHERRY STREETS PHILADELPHIA, PA.

WIRELESS-BARGAINS

We have purchased the entire stock of raw and finished material of the Etheric Wireless Mfg. Co. and offer these goods at **25 cents on the dollar.**



No. 125. TUNGSTEN NICKEL VEST POCKET FLASHLIGHTS
with Tungsten bulb and Ever-ready battery, complete - - **65c**
Extra bulb, **25c.** Extra battery, **25c**

THIS 50c POCKET CIGAR LIGHTER
Turn the wheel. Flint good for 5,000 lights. (2 for **25c**), or each - - - - - - **15c**
New Flints, **5c** 6 for **25c**

No. 10. TUNGSTEN FLASHLIGHT

6 Inches long. Complete - **90c**
Extra Battery **25c**
Extra Bulb - **25c**

ETHERIC WIRELESS DETECTOR

Regular Price $2.00. Bargain Price **50c**

Western Agents for ELECTRO IMPORTING CO. on Wireless Goods. Same Catalog. Same Prices. E. I. Co's. Wireless lessons, 1 lesson (numbers from 1 to 20 and cover) furnished with each $1.00 purchase. The complete set with $20.00 order.

Send 4c in stamps for our 3 complete catalogs and bargain sheet of raw material, and lesson coupons.

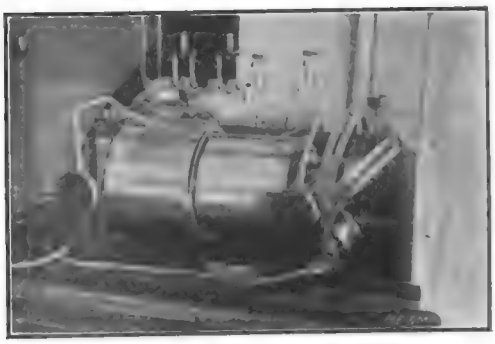
LA SALLE LIGHT CO.
Former location of Anderson Light & Specialty Co.
134-136 N. La Salle St., Chicago (Opposite City Hall)

variable condenser in the base of the large loose-coupler, as well as a loading coil which has proven of great value in tuning. A fuse is placed in series with the aerial. My receiving range is about 2,000 miles at night. My aerial is 80 feet high, and 80 feet long, composed of six No. 14 aluminum wires. All instruments are finished in oak and are entirely made by me, with the exception of the coil and phones. I am a steady reader of MODERN ELECTRICS AND MECHANICS, which I enjoy immensely.—*Isadore Weinstock, Philadelphia, Pa.*

HONORABLE MENTION.

I submit herewith a photo of my wireless receiving set.

My aerial, of the inverted "L" type, is 66 feet high, 130 feet long, and consists



RECEIVING APPARATUS OF E. H. TERRILL.

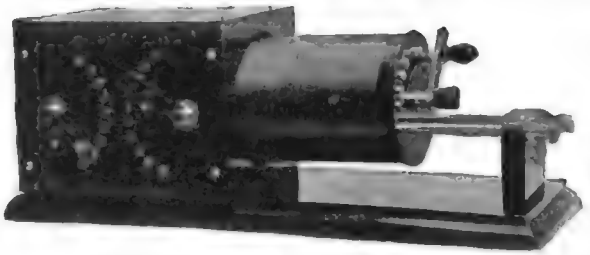
of six No. 14 aluminum wires on 16 foot spreaders, each wire being continued nearly to the instruments.

The receiving instruments, mounted in a sort of cabinet form, consist of the following: Clapp-Eastham receiving transformer, two ferron detectors of the same make, one of which is used for galena, two 31-plate rotary variable, and one fixed condenser, 2,000-ohm Western Electric head set and buzzer test. Two "Blitzen" loading coils may be thrown in by the two double-pole switches seen on top, thereby permitting of tuning up to 5,000 metres.

Almost perfect insulation has been secured by mounting all instruments, with the exception of the receiving transformer, on the sheet of hard rubber seen just behind it.

Digitized by Google

LATEST MODEL LOOSE COUPLER



Will tune up the 3000 meters. The taps do away with sliders and poor contacts.

HARD RUBBER CASING
Wood Work Polished Mahogany

11 Taps on secondary, which is wound with green silk covered wire. Slides easy and has cable connecting secondaries making permanent contact. All metal nickel plated.

Price $15.00 **Other Models $7.00 and $9.00**

Send two cent stamp *today* for folder showing my line of loose couplers and complete receiving sets.

J. F. ARNOLD, 243 East 118th Street, NEW YORK, N. Y.

GET LONG DISTANCE

This Detector Stand has been designed with the most carefu consideration as to the adjustment and insulation. The fine wire which crosses the silicon has just the proper spring to make a most sensitive contact. The base is of pure hard rubber 2"x4"x¼" thick, with four soft rubber feet. The metal parts are highly nickel plated.

The use of a well insulated and finely and easily adjustable detector stand will greatly increase your long distance signals.

This Highly Efficient Detector Stand $1.75

FREE SILICON!!

A good piece of silicon will be mailed free to each person sending a two cent stamp for our latest catalogue.

McCREARY-MOORE CO. **AUDION DETECTORS**

HALL BUILDING, KANSAS CITY, MO.

New High Grade Wireless Apparatus

Boston Variable Condenser, 25 Plates.....$3.75
" Mineral Detectors, composition base.... 1.75
" Combination Mineral Detector, white marble base 4.00
" Double Slide Tuner..... 3.50
" Helix, fine finish..... 3.50
" Junior Condenser, 50c; Large Condenser 1.00
" Small Spark Gap, 60c; Air-Cooled Gap. 1.00

Your money back on these goods if not satisfied.

Also Boston Agent for Elec. Imp. Co.

Manhattan Spark Coils Electric Supplies and Flashlights

M. MUELLER
18 Devonshire Street, Boston

The Wireless Map

A wireless encyclopedia in map form 38" x 28". All wireless stations with amateurs included shown with calls, location, power, type, ship routes and calls, time divisions, etc., etc. Free Circular. Price of map postpaid in tube.....$1.00

S. FRANCIS DASHIELL, Irvington, Baltimore, Md.

Wireless Maps are on sale with the following agents: Superior Wireless Co., 185 Congress St., Buffalo, N. Y.; Tufts Wireless Society, Tufts College, Medford, Mass.

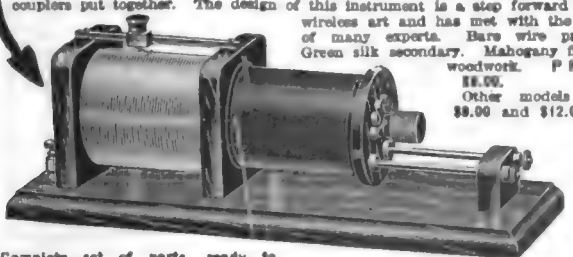
Licensed Agents for the Sale of
PERIKON CRYSTALS
(By the W. S. A. Co.)
For Amateur use only, $1.00 per set
THE RADIO AUDION DETECTOR $15.00
GEO. S. SAUNDERS & CO.
198 Washington Street BOSTON, MASS. 11 Devonshire Street

The Experimenters' Supply House

The best advertisement for the Amco Loose Coupler are the hundreds of well satisfied customers who have declared it is

THE MOST SERVICEABLE AND EFFICIENT LOOSE COUPLER ON THE MARKET

There are more of these instruments in service today than all other loose couplers put together. The design of this instrument is a step forward in the wireless art and has met with the praise of many experts. Bare wire primary. Green silk secondary. Mahogany finished woodwork. PRICE $5.00. Other models $4.00 $8.00 and $12.00.



Complete set of parts, ready to assemble, with blue print.....$3.50 With primary and secondary wound, $4.25.

SEND 4c. IN STAMPS FOR THE NEW AMCO CATALOG

We manufacture the largest line of reliable wireless apparatus in the country. Over 100 Wireless Instruments and 200 Parts, with which you can build your own instruments at small cost, are shown in our catalog. Also, Storage Cells, Rectifiers, Transformers, Motors, Dynamos, Steam Engines, Books, Tools, Model Aeroplanes, Electric Bicycle Lamps, Flashlights and Supplies.

ADAMS-MORGAN CO.
Box 72d
Upper Montclair, N. J.

Digitized by Google

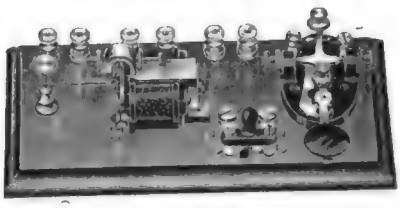
Did You See the

BUZZOPLEX

for Learning Wireless Signals. Testing Crystal Detectors. Regular Wireless Transmitting Key. And for operating regular telegraph line circuits many miles long with one cell of battery.

Send for free descriptive circular of the Buzzoplex. Also for our new Manual of Instruction and Wireless Catalogue.

A USEFUL APPARATUS



Price $12.00
Subject to Discount

J. H. BUNNELL & CO., Inc., Electrical Manufacturers 32 Park Place (Broadway Block), New York

AT LAST! A PERFECT SLIDER

Does not wear your coil, as the contact point can be lifted off the wire when you move it....Touches one turn of wire at a time....Contact always firm and certain....Compact, neat, and of the very best construction....Made for 3/16 and ¼th inch rods....Only 35 cents; or 2 for 56 cents, postpaid. NOTE: If you use galena, this slider will increase the sensitiveness of your set 25 to 50%. Address:

JOHN V. PURSSELL, Tenallytown Station, Washington, D. C.

LOOSE COUPLERS

LATEST IN DESIGN—$12.00

Turned wood ends, rules, wire, sliders, etc., sold separately. We carry complete parts for any wireless instrument. **Write for prices.**

Q. S. CROWTHER

1414 Pembroke St., Victoria, B. C., Canada

YOUR RANGE

depends greatly upon the detector you use. There is only one way to "get" all the signals which are passing over you—

Use Our AUDION DETECTOR

It is the last word in the detector line—extremely sensitive—absolutely permanent in adjustment—not affected by strong signals. Our complete detector set will prove to be the most wonderful instrument you have ever used.

Price, $15.00.
Tested bulbs only $5.00.
Renewal bulbs $3.50 each.
Old bulbs must be returned with order.

Our literature will be sent to you immediately free upon request.

THE WIRELESS MFG. CO. Canton, Ohio

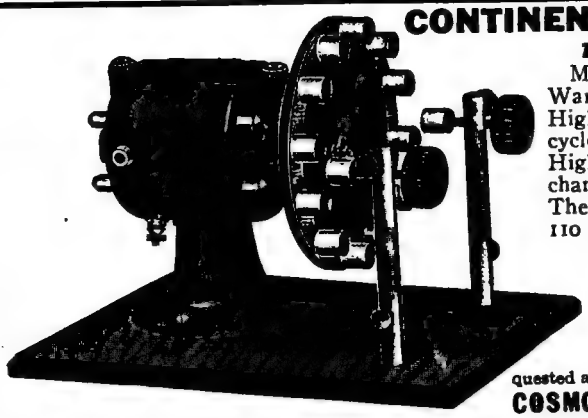
Halcun Junior Variable Condenser

New Halcun Junior Variable Condenser. Capacity nearly .001 MF. 16 stationary, 15 movable aluminum plates. Polished nickel plated brass case. Oil tight.

Price, Express prepaid in the United States $5.00

HALLER CUNNINGHAM ELECTRIC CO., 428 Market St., San Francisco, Calif.

CONTINENTAL ROTARY SPARK GAP



The Standard of all Makes

Moulded Composition disk 5" diam. cannot Warp Zinc Alloy Spark Points ½" x ½". High musical note; frequency 50 to about 600 cycles.

High Efficiency, Superior Workmanship; Mechanical and Electric Perfection Guaranteed The picture presents a gap with motor for 110 Volts A C or D C 3200 r. p. m.

Regular Price..... ...$14.00
This Month $9.50

Gaps with motor for 4 to 6 volts,

Regular Price.....$12.00
This Month..... 8.60

All Literature free with order, otherwise 5 cents requested and credited on first order.

COSMOS ELEC. CO., 136 M Liberty St., N.Y.

Digitized by Google

The set is very efficient. I can get the Arlington time signals and weather reports on any clear night, and have also picked them up in day time. In addition, I hear quite a number of the stations around the Lakes, together with a number of those further east and northeast.

I am greatly indebted to MODERN ELECTRICS for my success, and am greatly pleased with it.—*E. H. Terrill, Vandalia, Mo.*

HONORABLE MENTION

I herewith submit a photograph of my radio station.

My aerial is of the inverted L type, and is 90 feet long and 45 feet in height. It is composed of 4 seven-strand copper wires on 10-foot spreaders.

The receiving set is mounted in a birch cabinet, and is composed of the

WIRELESS STATION OF CLARENCE GUNDERSON

following instruments: Loose coupler, 2 variable condensers, 1 fixed condenser, cat-whisker detector, and a pair of Brandes superior phones.

The wires of the receiving set do not come in contact with wood at any point, being mounted on hard rubber throughout.

I have found galena to be the best mineral for long distance work.

I can hear all the lake stations very clearly with this equipment.

The sending set consists of 2 Leyden jars, helix, gap, and a spark coil operated by storage batteries. This outfit is used to work with an amateur in this city, there being no other within a 40-mile radius.—*Clarence Gunderson, Albert Lea, Minn.*

BRANDES' Wireless Receivers

Send for our descriptive matter on wireless receivers. It explains how Brandes' headsets are made, why they are better, and what we will do to convince you of this.

Enclose stamp for postage

C. BRANDES, Inc.
WIRELESS RECEIVER SPECIALISTS
3 Liberty St., NEW YORK

Pacific Coast—Aylsworth Agencies, 149 New Montgomery St., San Francisco.
Chicago—Winger Elec. & Mfg. Co., 711 So. Dearborn Street.
Australia—G. C. Hamilton, Ltd., 177 Elizabeth St., Sydney, N. S. W.

"SECONDARY UNITS"
FOR SPARK COIL AND TRANSFORMER SECONDARIES

Send 2 cent stamp for our "Secondary Unit" leaflet, also for catalogue of WIRELESS apparatus and supplies.

We are Chicago Agents for "BRANDES" WIRELESS PHONES

WINGER ELECTRIC & MFG. CO., (Not Inc.)
713 So. Dearborn St. Chicago, Ill.
Successors to Dawson & Winger Electric Co.

When writing, please mention "M. E. and M."

Google

Questions and Answers

Questions and queries pertaining to electrical and mechanical subjects and of general interest to all readers, will be answered in this department. Name and full address of the sender should accompany all inquiries. Questions that are not deemed by the editor to be of general interest, will not be published and no answers will be given by mail.

WAVE-LENGTH FORMULAE

(23) Charles Noble, Ind., asks:

Q. 1.—Does the tin coating on the wire detract from its value for wireless work?

A. 1.—Not appreciably.

Q. 2.—Please give me the formulae for calculating the wave-length of helixes and loose couplers.

A. 2.—If you are not familiar with mathematics to a wide extent you will have difficulty in attempting to calculate the total inductance of a loose coupler under its varying conditions. Fleming in "Principles of Electric Wave Telegraphy and Telephony" deals with this subject at some length. There are also several references in the form of Bulletins of the Bureau of Standards to which you might refer.

WAVE-LENGTHS.

(24) Walter A. Kilbury, Ohio, asks:

Q. 1.—Does the Arlington wireless station send out its time signals by exact Greenwich time of its longitude, or by Eastern Standard time? At what wave-length?

A. 1.—The Government station at Radio, Va., sends out the time signals at noon and ten o'clock in the evening by Eastern Standard time. A 2500 meter wave-length is used.

Q. 2.—If a loose-coupled receiving station employs only one variable condenser, is it preferable to shunt it across the primary or the secondary of the receiving transformer when receiving long wave-lengths?

A. 2.—This would depend on the construction of the loose-coupler. For most types it is preferable to put the condenser across the secondary because it is an easy matter to add a series loading coil to increase the wave-length of the primary. On long wave-lengths it is not usually necessary to use the condenser as a means of tuning out interference.

Q. 3.—In estimating the natural wave-length of an aerial as by the chart in the January issue, what must be allowed for the lengths of the aerial and ground lead-ins, where they are more than absolutely necessary?

A. 3.—The chart is made so as to include the length of the lead-ins. This will introduce a slight error for variable lengths.

DIRECT CURRENT DYNAMO.

(25) W. M. S., Brantford, Ont.:

Q. 1.—He has a laminated field structure 5 inches in outside diameter, 1¼ inches thick, with two poles. Armature has six round holes each ⅝ inch in diameter. He asks what winding should be used to give an output of six volts and three amperes, at a speed of 1,250 revolutions.

A. 1.—While such laminated structures are entirely acceptable for motors, they are really too good for generators, for they retain no "residual" magnetism, therefore fail to start. If you will make some thin iron castings of the same shape as the sheets, and clamp the sheets between them, you will avoid the trouble. You will probably have to leave the armature core the same length as at present. If you have insufficient room for the cast iron plates for the field magnet, leave out some of the sheets. Of course the machine will always generate if the field magnet is separately excited, and if you are to charge batteries, you can first start the machine as a motor, or leaving off one of the brushes, get the field excited from the battery before closing the armature circuit.

Q. 2.—What is the best way to wind the armature? Field is to be a shunt.

A. 2.—A diagram is really not so clear as directions. Wind slots 1 and 4 half full of wire, passing half of the turns on one side of the shaft, the rest on the other side. Leave out a loop, twisting it close up to the armature core, and without cutting the wire, wind a similar core in slots 2 and 5; leave out a second loop, and wind in slots 3 and 6; leave out a third loop, and wind a coil in slots 4 and 1—directly on top of the wires already there; this coil will provide a fourth loop, and coils and slots 5 and 2, and 6 and 3 will provide two more, the last being formed by twisting together the very beginning and end of the entire winding. The six loops are to be soldered into the six commutator segments. No. 20 wire will be a good size to use on armature, No. 23 on field, as much as you can get on. As for the other questions you ask—about the rectifier—you should address the dealers.

POLARITY OF COMPASS NEEDLE.

(26) Edward Grieb, Ohio, asks:

Google

If You Are Looking for Reliable and Well Made Apparatus or Parts

GET OUR CATALOGUE

It is the most complete up to date edition of its kind published. Here are some of the reasons why YOU should buy our apparatus.

Practically everything we use except raw materials is made in our own up-to-date plant.

We use only the best materials designs and workmanship. Every instrument is fully tested separately.

We fully guarantee each instrument for an UNLIMITED time.

Watch This Space Every Month for Something New

TRANSFORMERS

Highest efficiency closed core type. High silicon steel core and best copper windings. Primary layer wound. Secondary section wound and impregnated by special process. Empire cloth insulation throughout. Genuine mahogany cabinet. 8 variations of power ½ to 1 k.w.

PRICE $25.00
Shipping Weight 50 Lbs.

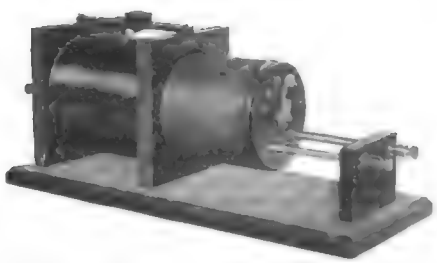
HEAD BANDS

Will never rust because they are made of genuine German silver throughout.

REGULAR PRICE EACH $1.50

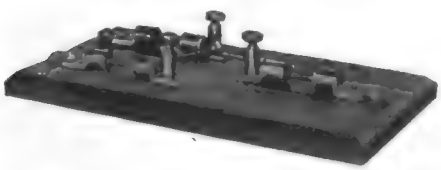
Special This Month Only $1.00 Each
Postage 10c.

LOOSE COUPLED TUNER



Loose coupled tuner—$6.00. Enameled wire primary. Silk wire Secondary with 6 tap switch on end Woodwork dark mahogany. Metal work polished brass. Shipping weight 4 lbs.

PROTECTIVE DEVICE



Do you have trouble from Kick-Backs? This protective device absolutely stops it all. Very effective and can be installed in 5 minutes. Order one now Shipping weight 1 lb. Price $2.50.

We manufacture a complete line of sending and receiving apparatus and parts.
Live Dealers Write for Good Agency Proposition.
Did you send 10c. for our New Large Illustrated Catalogue?
The printers have it nearly finished. Ready for mailing about Feb. 15.
The 10c. will be credited on your first order for 25c. or over.

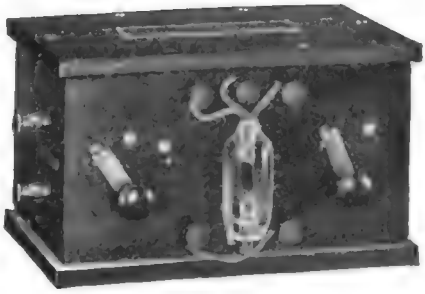
EDGCOMB-PYLE WIRELESS MANUFACTURING CO.

6029-6031 KIRKWOOD ST. **PITTSBURGH, PA.**

Digitized by Google

THE AUDION DETECTOR

Licensed for private, amateur or experimental use only. The only Audion Detector manufactured for the use of amateurs under the protection of the De Forest patents.



Type R. J. 4 Audion Detector illustrated above is operated by heated gases, employs a local battery and is complete with switches, batteries, rheostat and necessary connection.

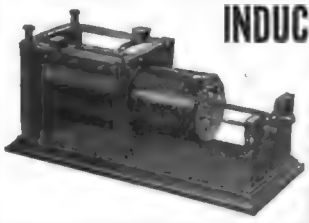
It is pronounced by experts to be the very best Detector obtainable anywhere.

Renewal Audion bulbs may be secured, in exchange for old or broken ones, for $3.50 and $5.00 each. All bulbs are tested before shipment, but the "X" grade, or $5.00 bulbs are tested for the maximum possible sensitiveness. With the Audion you can easily increase your range from 50 to 100 per cent.

Order One Today. Price $15.00

THE RADIO TEL. & TEL. CO., 309 Broadway, New York

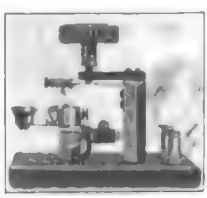
INDUCTIVE TUNER

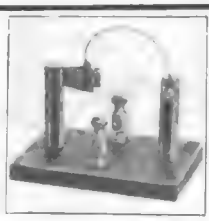


Want to do long-distance Receiving?

Why not begin right? Get one of our Prof. Type Tuners 7 x 7 x 18 in., has double slide, 8-point switch wound with Enameled Wire. Price $7.00; a pair of our Superior Receivers, 2,000 ohms; have no equal. Price $5.25; a fixed Condenser, just the right capacity, price 50c, without case 40c; and an Audion Detector, nothing so good, will not jar out, price $15.00; storage battery for same, price $5.00. With the above list of instruments you will get results you never even looked for. Or, with the Tuner, Superior Receivers and Fixed Condenser, use any Mineral Detector, and the results will surprise you. Send 5c. in stamps for Illustrated Catalogue. None otherwise.

F. B. CHAMBERS & CO., 2046 Arch St., Philadelphia, Pa.





Our DETECTORS are Guaranteed to give Full Satisfaction or Money Refunded

A1 Pacific Type, Yellow Lacquer, - -	$4.00
A1 Pacific Type, Nickel Plate, - - -	4.50
C1 Catwhisker Type, Yellow Lacquer,	1.25
C1 Catwhisker Type, Nickel Plate, -	1.50

SEND FOR CIRCULARS

THE LINDELL ELECTRIC SHOP 1807 Boren Avenue Seattle, Wash.

When writing, please mention "M. E. and M."

Q. 1.—If two north poles repel each other, how, then, is the north pole of a compass needle attracted by the north pole of the earth?

A. 1.—There is often much misunderstanding on this subject by the incorrect name of the end of the compass needles. The so-called north pole of the needle should be called the north seeking pole of the needle. With respect to what is usually considered north magnetic pole of the earth the end of the compass needle pointing in that direction may be considered to act as a south pole and accordingly points north. It is far better to use the more accurate term of north seeking pole and so avoid all chance for confusion.

Q. 2.—In the L type aerial, is the one in which the outer end is connected together as good as one where the outer end is open?

A. 2.—There is very little difference in these two types, but practise seems to favor the open end.

SAYVILLE RADIO STATION.

(27) Marquis Bryant, New York, asks:

Q. 1.—What does Sayville mean when he sends the letters NR 1 before each radiogram? Sometimes he sends other numbers besides 1.

A. 1.—This is the number of the message. The NR is the abbreviation for number and the numeral that follows is the message number.

Q. 2.—What does Sayville mean when before sending the press dispatches he says: "S. P. NR 1. To Debeg ships only"?

A. 2.—This is the number of the press dispatch and the words that follow limit the stations who may copy the dispatch and make it public. If this limitation were not used, any station could use the dispatch. Amateurs would do well to note this heading of the dispatch, for some day someone may wake up to the fact that he is liable to a fine of $250 for publishing some news item he copies from Sayville.

Q. 3.—Where can I obtain a copy of the book on Wireless written by Commander Robinson?

A. 3.—You can obtain a copy direct from the United States Naval Institute, Annapolis, Md., by remitting $1.50. The correct title of the work is "Manual of Wireless Telegraphy," by Commander S. S. Robinson, U. S. N.

ALTERNATING CURRENT MOTOR.

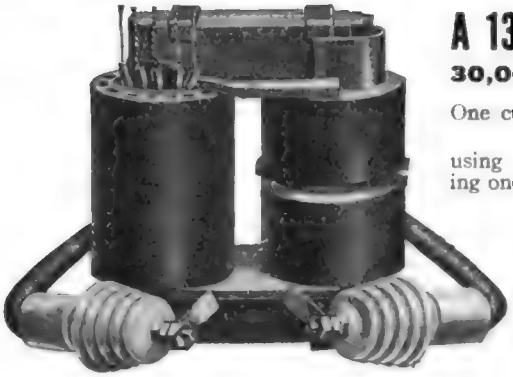
(28) J. F. H., Olive, Cal.:

Q. 1.—Sends a sketch of a small machine, and asks certain questions as to the winding that will enable it to operate on a 110-volt circuit. The field magnet is to be of cast iron.

A. 1.—Solid iron, whether cast or wrought, is entirely unsuitable for use in alternating current machinery. The structure must be of thin sheet iron, and the sheets reasonably well separated by use of asphaltum varnish or tissue paper. Solid iron results in the production of very large eddy currents, which means not merely a waste of power, but a ruin of the insulation by scorching. The dimensions you have shown are about those

(*Continued on page 386*)

Google



A 13200 Volt Transformer for $9.

30,000 Turns of Wire on This Transformer

One customer writes:-

"The best amateurs in Detroit are using your transformers. **That's why** I am ordering one."

Hundreds of other users have proved that the only way to get **efficient results** with the small condensers required by the Government is to use **High Voltage Packard Transformers.**

We have done all the difficult work and the transformer comes to you ready to mount in the case with **complete instructions.**

This is almost a ½ **kw. transformer,** for it can be safely used with 4 amperes in the Primary. It has Silicon Steel Cores, Vaccuum Treated Coils, 4 changes of power and requires **no external control.**

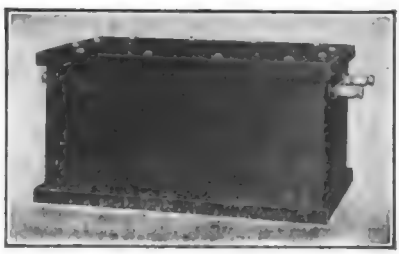
Transformer only $9. Insulators, Cable and Safety Spark Gap, $1.

Best send $10. for complete equipment.

The Packard Electric Company

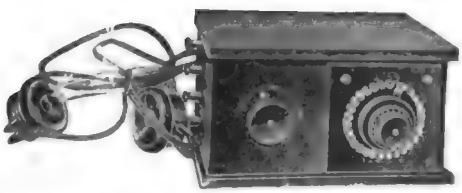
WARREN, OHIO

Transmitting Sets
Receiving Sets
Transformers
Condensers
Spark Gaps
Oscillation Transformers
Wave Meters
Tuners **Keys**



THE BLITZEN TRANSFORMER

¼ K.W. $15.00 ⅓ K.W. $22.00 1 K.W. $38.00



Blitzen Receiving Set, Price, $33.00

If its wireless, we manufacture it in the CLAPP-EASTHAM shops, the CLAPP-EASTHAM way; a little better than the best.

The most complete wireless catalog in America, also a catalog of parts and materials for the construction of apparatus, sent for 4c. stamps.

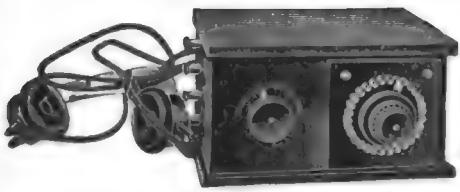
CLAPP-EASTHAM CO.

143 Main Street, CAMBRIDGE, MASS.

Aylsworth Agencies Co.
149 New Montgomery St., San Francisco, Cal.
Western Sales Agents

J. J. Duck Co.
432-434 St. Clair Street, Toledo, Ohio
Central States Agents

Google



The justly famous Blitzen Receiving Set. Complete with 2,000 ohm A.M. Style Murdock Head Set, **$33.00.** With Loading Coil mounted on cabinet to pick up the time, **$35.00.**

STOP! LO

$5.00

GIVEN AWAY ABSOLUTELY FREE TO EVERY SUBSCRIBER

profit by the

In making this amazing offer we are not unmindful of the enormous amount of moneyit was possible to give away in one month; neither were we unmindful that our well earned reputation for sincerity and truth in all our statements, gladly attested to by thousands and thousands of our patrons in all parts of the world, would vanish as if engulfed by an earthquake, did

1. To any subscriber to this magazine that will conscientiously write us that there is any other mail order electrical and wireless catalog published in any English speaking country that in size, completeness and artistic arrangement is equal to our catalog, WE WILL GLADLY GIVE $5.00 IN GOLD.

2. To any subscriber to this magazine that will conscientiously write us and give us the name of any wireless or wireless and electrical catalog that shows even *as much as one-half* as many wireless instruments of real worth as our catalog contains, WE WILL GLADLY GIVE $5.00 IN GOLD.

3. To any subscriber to this magazine that will conscientiously write us and show that he can purchase from any other concern as great and complete a variety of wireless instruments and accessories at no greater cost to him (mind you, we do not say just as much money) than if purchased of us, WE WILL GLADLY GIVE $5.00 IN GOLD. (See Sixth below.)

What Does Your Inability to

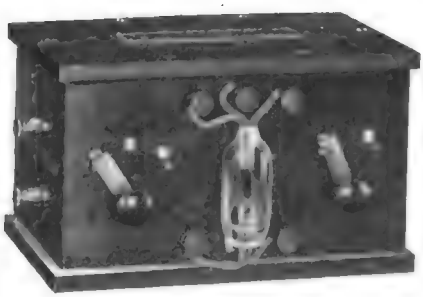
It means this: That you will earn the $5.00 many times over:

First. In having our new, big, 325-page electrical and wireless catalog in your possession (In these two pages we have not the space at our disposal to even attempt to describe the electrical portion of our catalog, which again far excels any mail order electrical catalog published) you have at once the *finest*, the *biggest*, the *most elaborate*, one of the *most artistic* and the *most complete wireless catalog published.*

Second. You have the choice of all the best and most approved wireless instruments now on the market, for commercial, private and experimental use.

Third. You have a veritable treasure house of wireless information. Exhaustive and elaborate write-ups on every conceivable wireless instrument, scores of wireless diagrams, elaborate and detailed instructions, with diagrams, for constructing the best types of aerials, and a great deal of information about the science and practice of wireless telegraphy.

Fourth. *Instead of wasting from 40c. to 50c.* in postage for a dozen catalogs, and thus run the risk, if you are inexperienced in wireless, of purchasing instruments of no real



Type R J Audion Detector, **$15.00.** The only Audion detector on the market licensed for private use. The most sensitive detector yet invented.

Do these compelling and impelling reasons

This elaborate catalog is mailed on receipt of only 6 cost of catalog and our low prices prohibits

Send for this catalog to-day.

THE J. J. DUCK COMPANY

Google

OK! LISTEN!

IN GOLD

TO THIS MAGAZINE that will take the pains to read and following conditions.

we fail to make good on such an unusual offer at 100 cents on the dollar, and we therefore ask your indulgence to read the conditions of this amazing offer and see if you are entitled to $5.00 in gold.

Our Murdock No. 505 Receiving Set. **Price, $50.00.** Consists of receiving transformer, two Variable Condensers, Loading Inductance, Silicon Detector, 2400 ohm double head set, and a testing button and buzzer, all mounted on beautifully finished mahogany base.

4. To any subscriber to this magazine that will conscientiously write us and show that as much as even one-half of the advertising space used in this magazine in the January number advertised wireless apparatus not found in our catalog, WE WILL GLADLY GIVE $5.00 IN GOLD. (We would not list in our catalog 4/5 of the balance.)

5. To any subscriber to this magazine that will conscientiously write us and show that our catalog does not contain 4/5 of all the first-class dependable wireless instruments advertised in the January number of this magazine, WE WILL GLADLY GIVE $5.00 IN GOLD.

6. To any subscriber to this magazine that will conscientiously write us and show that in any other three catalogs published (and this means the three best catalogs after ours) he can purchase a greater variety of first-class instruments and accessories than are found in our catalog, WE WILL GLADLY GIVE $5.00 IN GOLD.

7. This proposition is most cheerfully open to all our competitors.

Secure This $5.00 in Gold Mean?

worth, you have in our catalog the complete catalogs and literature of at least *eight concerns* constantly advertising in this magazine, *and the cream of the catalogs* of several other concerns.

Fifth. As a necessary corollary to what we say in No. 4, our catalog is, therefore, a Beacon Light and Guide to the inexperienced in wireless as to what is best to purchase. Our justly earned reputation for selling only such instruments that we can unqualifiedly guarantee, insures our patrons a square deal.

Sixth. It also necessarily follows from No. 4 and No. 5 that *transportation charges are greatly reduced* and *prompt service obtained* by purchasing your wireless instruments from the only concern that can in practically every case satisfy all your wants.

Seventh. All our wireless instruments and electrical goods, with the exception of our high power sets and special instruments, *are sold on approval*, we allowing our patrons to be the sole and absolute judges as to whether or not they have received exactly what they expected to receive. This proposition is printed on the inside cover of every catalog.

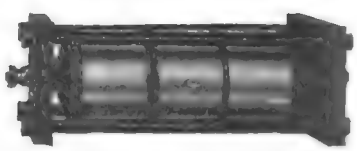
suggest why you are losing money by not having our big 325 page catalog?

cents in stamps or coin, which you may deduct on your first order amounting to $1.00. The great distribution except to those really interested.

You need it.

432-434 St. Clair St.

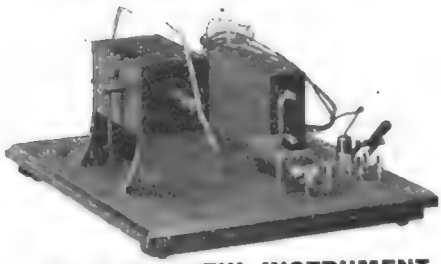
Toledo, Ohio



The New Compressed Air Spark Gap. Increases the efficiency of any spark coil or transformer from 50% to 90%. Sold on a money back guarantee. Read the article in the January number of MODERN ELECTRICS concerning this wonderful instrument.

Digitized by Google

A NEW APPARATUS FOR THE EXPERIMENTER



THIS WONDERFUL INSTRUMENT

produces a strong, heavy flame of high frequency current (about 150,000 volts, 400,000 oscillation) without the use of any induction coil, transformer, etc.

Runs on 6 dry cells or any lamp socket 110 or 220 volts d c or a c. Takes about 1/10 amperes.

Hundreds of experiments can be tried with it and an unlimited field is open for the inventive experimenter. For use in connection with wireless telegraphy, telephony, wireless transmission of power, production of X-rays, the so-called ultra-violet rays for medical purposes, vacuum tube light (Tesla Light, strong enough for illumination, the light of the future), development of ozone experiments with electricity as a growth stimulant, etc., etc.

SEND 2c. STAMP FOR LEAFLET

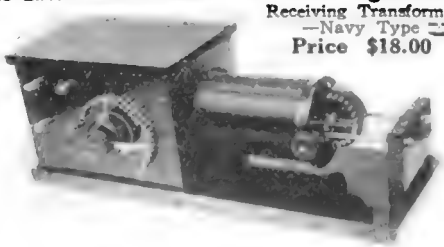
Price, highly finished hard wood $18.00, size 15 x 15 x 12 inches.

D. F. JANCKE LABORATORY
Room 401-402 500 S. Dearborn St.
CHICAGO, ILLS.

Vacuum (Geissler) Tubes made to order in all sizes and shape of letters and names. Very beautiful effect.

The Latest Achievement in Radio Engineering

Receiving Transformer —Navy Type
Price $18.00



SPECIAL FEATURES:—Interpolating primary Switching System (insuring positive contact). All conductive surfaces SILVER PLATED. an item of great importance, this combined with Genuine Hard Rubber Insulation, make it an instrument of absolute superiority.

Send for our Latest Bulletins.

THE RADIO APPARATUS CO.
Pottstown - - - Penn., U. S. A.

Note Sliding Adjustment
Price $2.00

IMPERIAL DETECTOR

The best detector made for amateur use. Is mounted on a polished fibre base. Has the most sensitive adjustment of any detector made.

SUPPLIES

Buy the raw material and make your own instruments.
Send for Catalogue K 4.

Imperial Electric & Mfg. Co.
6855 So. Halsted St. CHICAGO, ILL.

When writing, please mention "M. E. and M."

(*Continued from page* 382)

given for Watson's ¼ horsepower direct current motor, but even if you made the field magnet of a stack of sheet iron in place of castings, you would fail to get a satisfactory operation on alternating currents—the sparking would be furious. The series of articles on alternating current motors now appearing in this magazine will explain the proper construction of quite a variety of machines.

Q. 2.—Can a magneto generator be used as a motor on direct current supply?

A. 2.—The magnetos you describe have regular direct current windings with numerous commutator segments, and should operate well as direct current motors. Possibly your failure has been due to defects in the winding, or perhaps the brushes are not in the right position. They should touch segments that connect with coils lying midway between the poles.

TENSILE STRENGTH.

(29) F. J. S., Worcester, Mass., asks for:

Q. 1.—Data as to the values for wood, rope and iron.

A. 1.—For California redwood and white pine, the tensile strength is about 7,000 pounds per square inch of section when with the grain, and about 500 pounds across the grain. White oak has values of 10,000 and 2,000, respectively. A Manila rope ¾-inch in diameter will break at a pull of 4,000 pounds, a 1-inch rope at 7,150, a 2-inch rope at 28,600. Wrought iron has a strength lying between 47,000 and 62,000 pounds per square inch of section.

SOLENOIDS.

(30) W. J. S., St. Louis, Mo.:

Q. 1.—Asks for directions for making two such appliances for operating in combination with a float valve to give automatic control to a pump motor.

A. 1.—As we do not know the exact sizes of the parts you already have on hand, we cannot as yet propose any specific dimensions. In general, the two solenoids would have quite different characteristics, for one is to work through only a short distance and with small pull, the other, for a long distance. We would suggest that you procure a copy of Underhill's book on "The Electromagnet." It gives a good many illustrative calculations for such coils.

ELECTRIC AUTO HORN.

(31) Charles S. Martin, Virginia, asks:

Q. 1.—I have on my automobile an electric auto horn which I am operating from a five-cell storage battery. I would like to change over and put it on the magneto used for the spark plugs. Can I do this by putting resistance in series with the magnets of the horn?

A. 1.—If the magneto is a high tension one, as it appears to be from your letter, it will not be possible to operate the horn from the magneto. The magneto would not deliver sufficient current for this purpose, and in addition, the voltage is far too high to be running around on a push button circuit to the horn.

Digitized by Google

A Great Technical Library

In Simple Language

Out of a world-wide experience in teaching the engineering trades and professions by correspondence the International Correspondence Schools have perfected the greatest system of textbooks in existence. More than $2,000,000 has been expended in their preparation and $100,000 is spent annually to keep them up to date.

Prompted by many requests for these textbooks without the correspondence instruction the publishers have issued a special edition from which the very elementary subjects and examination questions have been omitted. These volumes are now being offered for sale to the general public in lots of five or more on easy monthly payments.

Choose the Books You Need

The 119 volumes included in this Library cover nearly every phase of mechanical and electrical work, mining, architecture, advertising, business, commercial law, etc. Being designed for home study, these textbooks are written in the very simplest terms so that men with only an ordinary education can easily understand them. And each volume is indexed and cross-indexed so completely that any desired information can easily be located on a moment's notice. The following is a partial list of the different lines of work covered by this Library:

Civil Engineering	Business
Concrete Engineering	Chemistry
Electrical Engineering	Automobile
Mechanical Engineering	Architecture
Telep. and Teleg. Engineering	Shop Practice

Just indicate on the attached coupon the subject in which you are interested and mail the coupon to us. This will not obligate you in the least but will bring you a complete table of contents of the volumes on this particular subject, together with our plan of easy monthly payments.

International Textbook Company
Box 992-L, Scranton, Pa.

Exclusive Features

They are more profusely illustrated than any other technical books.

They are written in a simpler style and more easily understood terms than any other technical books.

They are used as textbooks by more than 200 of the leading colleges and universities.

They are kept thoroughly revised and up to date

I. T. Co.
Box 992-L,
Scranton, Pa.

Without obligating me in any way you may send me catalog and description of volumes on the subjects before which I have placed an X.

__Civil Engineering __Business
__Concrete Engineering __Chemistry
__Electrical Engineering __Automobile
__Mechanical Engineering __Architecture
__Telep. & Teleg. Engineering __Shop Practice

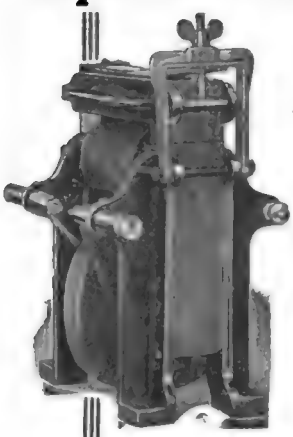
Name _____

St. and No. _____

City _____ *State* _____

Digitized by Google

Improve Your Sending



No matter how good an operator you may be, you can't get results with poor apparatus. The **Thordarson Wireless Transformer** carefully designed and constructed, will help you to better wireless. 5,000, 10,000 and 20,000 volt standard types—special windings to order. Connects direct to A.C. mains—equipped with flexible impedence.

Write for Details.

Thordarson Elec. Mfg. Co.
509 South Jefferson Street, Chicago

Your Wireless Set

Mighty few would even think of starting a radio set without first consulting

Edelman's "Experimental Wireless Stations"

It gets you started right, saves dollars, time, and prevents failure. It puts you "hep" to the real facts and up to date data which you simply must have. Readers without any previous experience are successfully building and operating stations, are getting licenses, hearing long distance, and doing the other big things you read about. Used by schools, endorsed by U. S. Radio Inspectors. Just as important as the detector and phones. Get your copy now.

New 1914 Revised Edition $1.50 postpaid. Guaranteed.
(*Accept no inferior "just as good"*)

Almost given away. While they last, only 12c buys a great little book (Postpaid) showing exactly how to put up a station to comply with the law, at small cost. Tells what you want to know. Get it now

"Experiments" "Experiments" "Experiments"
by Philip E.Edelman, (in preparation $1.50. Pre-publication price $1.00)

It affords great pleasure to announce and much satisfaction to know that this new book of "splendid experiments requiring a small outlay," is developing into "best ever" shape. Wide awake readers are piling up the advance orders at the 33 1-3% discount for advance orders, and it will be necessary to withdraw this offer soon. If you are interested in wireless, electricity, high frequency, chemistry or physics, make no mistake; send your dollar today. Guaranteed.

PHILIP E. EDELMAN - Minneapolis, Minn., U.S.A.

When writing, please mention "M. E. and M."

TRANSFORMER EFFICIENCY.

(32) H. M. Read, Texas, asks:

Q. 1.—I have been informed that an open core transformer takes about half of the power to transmit a mile that a closed core does. Why is this, because I always thought that the closed core type was the more efficient?

A. 1.—There seems to be some peculiar features about the operation of open core transformers which are not entirely clear. In general the closed core is the more efficient type, and for transmitting long distances less power is required for the closed core than for an open core to cover the same range. Where spark-coils are used over short distances many records have been made which could hardly be even approached by a closed core transformer of the same power consumption. The figures on the subject vary widely and there is great doubt why this reversal should occur. In general, about 10 watts per mile is allowed. This is, of course, a very variable figure and at the best is only a rough approximation.

MOTOR LOAD.

(33) G. M., Elgin, Ill., asks:

Q. 1.—Would a series wound fan motor, operated on a 110-volt circuit, be injured by holding it from rotating, the current being kept on?

A. 1.—It certainly would burn out. While it is true that such small motors have a high internal resistance, thereby making them to some extent "fool-proof," there would be sufficient heat produced to destroy the insulation in a few minutes. When a motor rotates, a counter electromotive force is set up, and it is by this action that the current is kept to a proper value. If you hold the armature, or even if loaded to an undue amount, the counter electromotive force is thereby annulled or reduced, and ruinous currents will flow Even in motors of ½ h.p., the c.e.m.f. is likely to be 90 per cent. of the applied, and in larger machines still higher. It is the difference between the applied and the counter e.m.fs. that determine the motor current. In the case of the fan motor you have very inefficient conditions, and even if running free, it will get very hot. If you remove the fan and substitute a pulley, and try to drive some machinery, although you use no more current, the motor may burn out, for in the absence of the usual cooling action of the fan, the internal temperature will be much greater.

ELECTRICITY ON PLANTS.

(34) Emil J. Stiber, Chicago, asks:

Q. 1.—Will you please tell me how electricity is applied to plants to make them grow?

A. 1.—This subject is very much in the experimental stage and there is relatively little published on the subject. We would suggest that you write to the Bureau of Agriculture and see if they have any publications on the subject. The publications will be sent free or for a very small charge. The method of using the electricity is to use a very high potential and frequency and obtain a brush discharge along wires erected over the plants.

Digitized by Google

The Grant Receiver

Has no equal for long distance work. Durable, sensitive and scientifically correct.

Head Band weighs only *3 ounces.* Connects to receiver by special non-conducting flexible tubing. Perfect insulation; no shocks to operator.

Magnets can be adjusted very close to diaphragm, insuring least magnetic leakage.

Buy No Receiver until you get our booklet A, fully describing the "Grant."

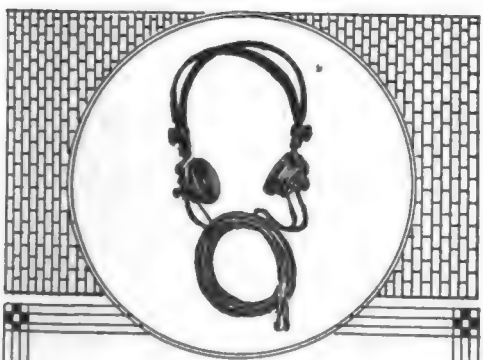
Price, Complete Set as illustrated herewith $9.00

We make a full line of Wireless instruments. Description mailed on request.

The Grant Electric Co.

813 Prospect Ave.

Cleveland - - Ohio



Holtzer-Cabot Radio-Receivers

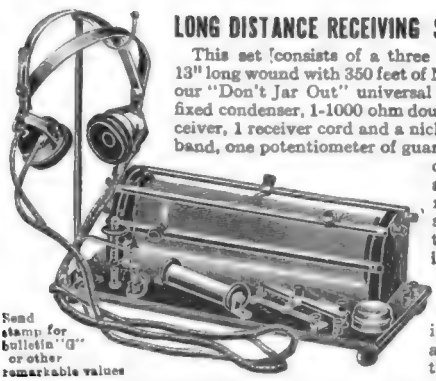
Talk with any operator who is using them—you're sure to find him enthusiastic.

Send for Booklet 20E3

The Holtzer Cabot Elec. Co.

BROOKLINE, MASS.

Chicago New York Baltimore



Send stamp for bulletin "G" or other remarkable values

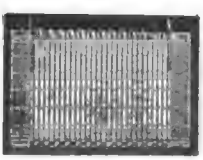
LONG DISTANCE RECEIVING SET $6.75

This set consists of a three slide tuner 13" long wound with 350 feet of No. 24 wire, our "Don't Jar Out" universal detector, 1 fixed condenser, 1-1000 ohm double pole receiver, 1 receiver cord and a nickeled headband, one potentiometer of guaranteed 365 ohm resistance 1 buzzer and switch that tells if your detector is working, 12 insulators and directions.

NICHOLS ELECTRIC CO., 35 Frankfort St., New York

RESISTANCES

FOR WIRELESS TELEGRAPH AND TELEPHONE



And for all other purposes. Connect your induction coil or transformer on any lighting or power circuit. Cheapest and best made units for 110 volts, ½ amps 56 cents. Send for catalogue.

DUBILIER ELEC. CO., Inc.

63 Fifth Ave., New York, N. Y.

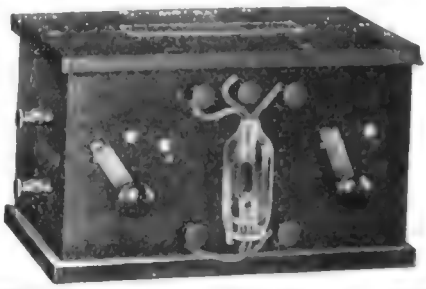
Have You Seen the Dubilier Electric Radiator for Heating? Sells for $5.00.

Google

AUDION DETECTOR

Mfg. by RADIO TEL. CO.

Tests by U. S. Bureau of Standard have shown it to be 50% more sensitive than any other form of detector (Bulletin, Vol. 6, No. 4, Pg. 540). No other detector needed. All connections marked on Cabinet. Can be operated by 3 dry cells; best results obtained with 4 v. Storage Battery.



Audion Detector complete (less Storage Battery)...	$15.00
4 v. 30 amph. Solar Storage Battery.....	5.00
Extra lamps, upon return of old one.....	3.50
Extra sensitive tested lamps.....	5.00

STORAGE BATTERIES

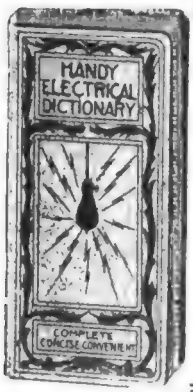
The plates and jars of "Solar" batteries are identical with those of the high grade "Helios" ignition battery.

This is the first opportunity the amateur has had to obtain a really good storage battery at a low price.

4 v. 30 amp. hr. "Solar" Ready for use.....	$5.00
4 v. 60 " " "	8.00
6 v. 30 " " "	8.00
6 v. 60 " " "	10.50

Aluminum Wire No. 14 gauge, 50c. lb. Murdock Wireless goods. Thordarsen Transformers and other first-class material.

J. ELLIOTT SHAW CO., 632 Arch St., Phila.



ELECTRICAL

This dictionary contains upwards of 4,800 words, terms and phrases employed in the electrical profession, with their definitions given in the most concise, lucid and comprehensive manner.

VEST POCKET

Much thought and great care has been exercised in the preparation of this unique work by the author, Mr. William L. Weber, M. E.

This valuable book will be sent postpaid to any address on receipt of price, only [illegible]

Modern Publishing Co.
231 Fulton St., New York.

DICTIONARY

Girls — Girls — Nothing But Girls

Classy pictures of beautiful women in natural and entrancing poses. Really delightful. They will increase your heart beats (if you are human). Just the kind of pictures that you may have been looking for. A fascinating set of ten pictures sent in plain wrapper for 50c. (stamps or money order). Order a sample set and you will want more of them. **BRONX GIRLS CLUB, 417 E. 151st St., New York**

WATER HEATER

(35) Thomas Slattery, Chicago, asks:

Q. 1.—How can I make an electric water heater which can be used to heat the water in a bath tub?

A. 1.—This is a very practical problem, especially if the fire in the regular heater is out, but it is not solved as easily as one would like to have it. Because of the high specific heat of water it will take a very large amount of energy to heat the water. At least a consumption rate of 10 kilowatts would be necessary to heat sufficient water in half an hour. In addition to this the heater should be in a water tight receptacle, and yet capable of readily radiating its heat. If you desire such a heating device we would recommend that you correspond with the Simplex Electric Heating Co., at Cambridge, Mass.

TUNING COIL.

(36) Orville Drake, Indiana, asks:

Q. 1.—What are the best proportions of the length to diameter of a single slide tuning coil?

A. 1.—It is considered good practice to have the length about four times the diameter.

Q. 2.—Would number 18 S. C. C. copper wire be a good size to wind such a coil with?

A. 2.—Yes, it would do very well. It would be better if you could use bare wire.

Q. 3.—What is the best mineral to use for a detector?

A. 3.—For a long time it was considered that the combination known as perikon was the best, but later results have shown that galena using a fine wire for the contact is superior to perikon.

IMPROVING THE CONDITION OF EMPLOYEES

It is gratifying to note the increasing number of firms that are sharing the profits of the business with their employees. A few years ago such an action would have been very uncommon, but to-day there are many firms that grant annual bonuses to their employees. In fact, it is a sign of the times—a forerunner of an era of better understanding between Capital and Labor.

Although the business transacted by the L. S. Starrett Company of Athol, Mass., suffered a depression during the latter part of the past year, due to the general poor business conditions, the firm again declared a bonus of 2 per cent. to each employee of the total wages paid him during the past year. The firm also granted a similar dividend in December of 1912.

If You Will Take Advantage of This Right Away

In addition to sending GAS ENERGY, which is the liveliest and newsiest for those interested in gas engines, for one year, we will send you free a copy of "How to Run and Install Gasoline Engines." GAS ENERGY covers the Stationary, Portable, Automobile, Marine, Aeronautic, and Producer fields in a way that no other paper does. Just send 50c. in postage or currency and we will enter your subscription for a year and mail you gratis copy of the above mentioned book.

GAS ENERGY CO., 22 Murray St., NEW YORK CITY

Google

MODERN ELECTRICS AND MECHANICS

Classified Advertisements

You will find it a good investment to use these columns.

Advertisements in this department 5 cents a word; no display of any kind. Payable in advance, by currency, check, money order or stamps. Count 7 words per line.

5% discount for 3 insertions
10% discount for 6 insertions
15% discount for 9 insertions
20% discount for 13 insertions within one year.

One of the most profitable high grade classified mediums in the United States. Try it out.

Advertisements for the April issue must be in our hands not later than March 1st.

AGENTS

EXCLUSIVE TERRITORY NOW BEING ALlotted for Little Giant Lift and Force Pump. Only thing of its kind; it has free field wherever there's plumbing. Removes all stoppages in pipes, saves plumbers' bills, prevents noxious gases. Everyone wants it, everyone can afford it, everyone can operate it. As strong in business world as among homes. Selling at top speed. 50,000 already in use. I can grant you absolute monopoly and fix you for life, if you are the right man. Address at once, J. E. Kennedy, M. S. 18, 41 Park Row, New York City (r)★

GET AGENCY—CAMPBELL TIME SWITCH—automatically turns on or off electric lights at any predetermined time. The Campbell Bell Transformer rings electric bells from the electric light current. Great line to sell the stores and the homes. Write quick. Campbell Electric Co., Lynn, Mass. (r)★

$50.00 PER WEEK AND UP. HOW FAR UP depends on you. Enormous sums are being made by Oxygenator Salesmen—one has made $21,500 in three years; another $6,000 in one year; another $4,500 in six months. Western Oxygenator Co., Beatrice, Neb. (r)★

AGENTS—NOVELTY KNIVES AND RAZORS are lightning sellers. 100 per cent profit. Exclusive territory. Goods guaranteed. Novelty Cutlery Co., 305 Bar St., Canton, O. ★

AGENTS CATCHY SONG—WOULD YOU LIKE a Little Girl Like Me. Copy 10c. Music Publisher, Box 991, Syracuse, N. Y.

SPARE TIME—NO CANVASSING. REPORT information, names, etc., to us. Markets waiting. Enclose stamp. "NISCO," Dept. HDF, Cincinnati. (10)★

AGENTS—GET IN QUICK ON THIS. "SX" marks tools, steel, iron, etc. Agent's sample ten cents. Essex Laboratories, West Lynn, Mass.

WANTED—MAIL ORDER DEALERS TO ENclose stamp, description and prices best 25c article ever offered. New. Phelps Specialty Company, Dept. O, Caro, Mich.

PATENTED STICK-PIN GUARD, PREVENTS loss of pin. Gold plated. Postpaid for 10 cents. Special prices in quantities to agents and mail order houses. Abner B. Shaw, No. Dartmouth, Mass.

THIS ELECTRICAL DICTIONARY WILL just fit in your vest pocket. Carry it around with you while you are at work. "Handy Vest Pocket Electrical Dictionary," by Wm. L. Weber, M. E., containing upwards of 4,800 words, terms and phrases employed in the electrical profession with their definitions given in the most comprehensive manner. Full leather cover; 50c, postpaid. Modern Publishing Co., 231 Fulton St., New York. (tf)

BUSINESS OPPORTUNITIES

SAFETY RAZOR BLADES SHARPENED ON the "American" machine are Positively Sharp. If none of these machines are in operation in your locality, then send the blades to us; we will sharpen them for you at the rate of Gillette and other small blades 2½c each. We also sharpen and hone the ordinary razor. Complete sharpening outfits furnished to those desiring to engage in this profitable business. Full information free. American Sharpening Machine Co., Dept. M, 184 Washington St., Chicago. ★

500 PER CENT. PROFIT IN ORNAMENTAL casting of concrete, artificial marble, plaster, papier-mache, marble dust, imitation wood, soft metals, for manufacturing interior, exterior decorations, garden furniture, statuary, artistic homes, fountains, sanitary flooring, tiling, tombstones, cement caskets, stuccoing buildings, life casting, ornament copying, modeling, coloring, gilding, making elastic, rigid moulds, instructions complete $1. Material furnished. Free! 200 illustrations beautiful casts. (Mail address today.) W. L. Mahler, 117 Russell St., Brooklyn, N. Y.

FREE FOR SIX MONTHS—MY SPECIAL OFfer to introduce my magazine "INVESTING FOR PROFIT." It is worth $10 a copy to anyone who has been getting poorer while the rich, richer. It demonstrates the REAL earning power of money, and shows how anyone, no matter how poor, CAN acquire riches. INVESTING FOR PROFIT is the only progressive financial journal published. It shows how $100 grows to $2,200. Write NOW and I'll send it six months free. H. L. Barber, 418, 30 W. Jackson Blvd., Chicago. (6)★

FORMULA AND INSTRUCTIONS FOR MAKing and selling most reliable and effective razor and safety blade sharpener—use any kind of strop. Includes process for resharpening safety blades (without machinery). Blade Process, Box 816, Richmond, Virginia.

MAIL DEALERS—MY JOKE-NOVELTIES ARE paying big profits. Imprint catalogue supplied at actual printer's cost. Joseph M. Mathieu, 203 Court St., Brockton, Mass.

NAMES FOR SALE—MAIL BUYERS, FARMers, school teachers, agents; original letters for rent. Big Mail Directory, 1124 Foster Ave., Chicago. (2)

MAKE FROM $100 TO $500 A MONTH WITH illuminating paint. Particulars for stamp. M., Box 35, Hagerman, Idaho. (1)

"MONEY MAKING IDEAS," PUBLISHED monthly, turns your spare time into cash. Sample copy free. A. Kraus, 409 Chestnut St., Milwaukee, Wis. ★

$5 DAILY EASILY EARNED AT HOME IN spare time silvering mirrors; no capital required; particulars free, giving full, explicit instructions. Geo. L. Patterson, Dept. N, Brooksville, Ky.

THE BEST MAIL ORDER PROPOSITION ON earth. Particulars free. Luther Gordon Co., Northwestern Bldg., Chicago. (10)★

EMPLOYEE! IF YOU DON'T MAKE $10 A day, write me. C. Henrikson, Box 247, Tioga, N. Dak.

"THE GREATEST MAIN ORDER PROPOSItion Ever Placed in Your Hand"; "The Medical Field"; "Building a Business with Beauty Preparations"; "The Mail Order Book Business," and many other feasible plans fully explained in current Booster Magazine—the one bona fide publication devoted exclusively to the interests of agents and all interested in the Mail Order Business. More people read "Booster" than any other trade paper—this alone should convince you that to-day is the day to learn all about "Booster"—it's money coining suggestions and propositions. Join our ranks now. Let "Booster" put you next to the best money making propositions—ones that actually get you the money! Ten cents brings two copies worth dollars to you. If you're dissatisfied your dime back. Booster Magazine, 354 Northwestern Bldg., Chicago.

Digitized by Google

AUTOMOBILES

USE AN AIR-FRICTION WITH NEW 1914 IMprovements. Increases power and economy of motor one-half. Absolutely impossible to choke or load. Uses distillate, gasoline or half kerosene with finest results. Starts easy in coldest weather. We fit all motors, guaranteeing definite results or refund money. Exclusive county rights. Liberal exchange on other carbureters. The Air-Friction Carbureter Co., Dayton, Ohio. (r)★

BIG MONEY VULCANIZING TIRES; BUSIness growing fast; start at home; small capital; easy learned; book 50c. Vanderpool's, Springfield, O. (r)★

BOAT BUILDING FOR AMATEURS. BY Adrian Neison, C.E.—This book will tell you how to build all manner of small boats, such as punts, skiffs, canoes, row and sail boats. Only $1.00, postpaid 231 Fulton St., New York City. (tf)

BOOKS, ETC.

SECOND-HAND BOOKS—HALF PRICES ON every subject; new 50 per cent discount; books bought; catalogue No. 818 free. Foyle, 121 Charing Cross Road, London, England. (1)★

SEND 12c. FOR "SEXUAL PHILOSOPHY," clearest, best, most instructive sex manual published. Actually teaches, not merely argues. Write today. "Health-Wealth" Publishing House, 89 Bennington St., Lawrence, Mass. (2)

FREE CATALOGUE OF USEFUL AND ENtertaining books for pleasure and profit. John A. Sheridan Co., 417 East 151st St., New York.

GET VALUABLE MAIL. WHOLE YEAR FOR 20 cents. Money returned if unsatisfactory. Cornish Electric Company, Schenectady, N. Y.

BOOKS ABOUT ELEVATORS—BEST PUBlished. Morse, 19 Union Pl., Yonkers, N. Y. (3)

MODERN ELECTRICAL CONSTRUCTION. BY Henry C. Horstmann and Victor H. Tousley. A new revised and enlarged edition, 16mo., 358 pages, 178 diagrams. Pocket size, full leather limp. Price, $1.50 postpaid. Modern Publishing Co., 231 Fulton St., New York. (r)

A SAMPLE COPY OF PROGRESSIVE YOUTH will be sent on request to anyone; the Progressive Youth is the greatest and liveliest monthly magazine in Ohio; advertising rates most reasonable; sent on request; subscription price, 50 cent a year. The George H. Bender Publishing Company, 7917 Central Ave., Cleveland, Ohio.

JUST OFF THE PRESS—BOUND VOLUME No. 5 of Modern Electrics; contains more real information than is found in $50.00 worth of electrical books; 1,344 pages; 2,100 illustrations; 1,050 questions and answers. A veritable encyclopedia on electricity. If you are a student of electricity or desire to keep in touch with the electrical progress of the world you can't afford to be without this wonderful collection of data on inventions, illustrations and writings of leading authors from every part of the world. Positively only 20 sets left. Orders will be filled as received and money returned when supply is exhausted. Price, $3.00; 65c extra by mail in U. S.; 95c extra in Canada. Modern Publishing Co., 231 Fulton St., New York, N. Y. (tf)

HAVE 21 COPIES OF MAGAZINES FROM August, 1911, to July, 1913. All in good condition; cost, $8.15. Would like perikon set or small variable condenser, or something in receiving line. J. Keers, 334 81st St., Brooklyn, N. Y.

BOAT BUILDING FOR AMATEURS. BY Adrian Neilson, C. E.—This book will tell you how to build all manner of small boats, such as punts, skiffs, canoes, row and sail boats; only $1.00, postpaid to any address in the U. S. Modern Publishing Co., 231 Fulton St., New York City.

EXCHANGE A SEVEN VOLUME CYCLOPEdia of electricity edited by the American Technical Society and which cost $19.85 six months ago, for an extra good professional type loose coupler, high voltage transformer or other apparatus. Carl Schaefer, 2118 Stillson Ave., Sacramento, Cal.

HELP WANTED

THOUSANDS OF GOVERNMENT POSITIONS open to men and women over 18. $65 to $150 month. Vacations, steady work. Parcel Post means many appointments. Common education sufficient. "Pull" unnecessary. Write immediately for free list of positions now available. Franklin Institute, Dept. D 203, Rochester, N. Y.

LEARN THE REAL ESTATE BUSINESS—OUR complete instruction book teaches listing, appraising, management, salesmanship, insurance, brokerage, advertising, renting agency, forms, etc. 121 subjects. Excells $20.00 correspondence course. Buckeye cover, 75c. Silk cloth, $1.00 postpaid. Realty Book Co., 5997 Euclid Ave., Cleveland, Ohio. (3)★

$$$$$$$$$$EARN $100 MONTHLY REPORTING local information. Name, etc., to us. We control valuable markets. No canvassing. Enclose stamp. National Information Sales Company.—BCQ—Cincinnati, Ohio.

FREE ILLUSTRATED BOOK TELLS OF about 300,000 protected positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet S-947. No obligation. Earl Hopkins, Washington, D. C.

I WILL START YOU EARNING $4 DAILY AT home in spare time silvering mirrors; no capital; free instructive booklet, giving plans of operation. G. F. Redmond, Dept. A. G., Boston, Mass. (6)★

MECHANICAL DRAWING. THE WARNER system makes expert draftsmen. If you are earning less than $25.00 per week we can increase your salary. Free book. Colorado Correspondence College, Dept. 55, Denver, Col.

WANTED—SEVERAL HONEST, INDUSTRIOUS people to distribute Patriotic Literature. Salary $60 per month. Prof. Nichols, Box F, Naperville, Ill. (r)★

ELECTRICAL APPARATUS

VOLTMETERS AND AMMETERS, $1.25. IMproved, accurate and quick-reading. Ideal for experimental purposes. Built to remain in circuit without injury. Not effected by direction of current. Progressive Mfg. Co., Box 295, Reading, Pa.

ELECTRICAL GOODS AT REASONABLE prices. We sell revolver flashlights, complete, for $1.25. Also many other bargains. Write for circulars. J. W. Denton, Gregory, Mich.

DIAMOND TRANSFORMERS OPERATE BELLS, toys, signals, rectifiers for charging storage batteries and spark coils through stepdowns from 110 v. Most reliable on the market. See Advt.

DIAGRAMS—OUR MODERN BLUE PRINT Chart Method of Electrical Wiring. Write for information. Electrical Wiring Diagram Co., Box C-173 Altoona, Pa. (1)

DETECTIVE PHONE—MAKE ONE YOURSELF. You can hear a whisper. Plans and information 25c. Lobe Mfg. Co., 167 W. 102d St., New York City.

MOTION PICTURE PLAYS

WRITE MOVING PICTURE PLAYS; $50 EACH; all or spare time; no correspondence course. Details free. Atlas Publishing Co., 353, Cincinnati, Ohio. (r)★

SCENARIO WRITERS LISTEN, "A BARGAIN." I typewrite photoplay manuscripts of 1000 words, furnish carbon copy, advise sale, only $1. Address Photoplay Typewriter, 5735 Pine St., Philadelphia, Pa.

Google

FOR SALE

BRANDES $13 NAVY PHONES, $8. PRACTICally new; 150 ohm double head set, self-assembled, $1.00; $5.40 Mesco 1 in. coil, $2.50; 3½ lb. No. 14 aluminum wire, $1.00; $1.50 Eveready ammeter, $.50; 5 ohm telegraph instrument, $.75; other bargains. Hallie Hawkins, 245 S. Front St., Columbus, Ohio.

8 KW. TRANSFORMER FOR SALE. TYPE E, Clapp-Eastham Co. make. Has four variations of power. Transformer is in fine condition; as good as new. Cost $150.00. Will sell for $60.00. A bargain. The San Antonio Wireless Association, 350 E. Commerce St., San Antonio, Texas.

FOR SALE—WIRELESS SPECIALTY APPAratus Co.'s phones with adjustable magnets, new, very sensitive, 900 ft. 7-stranded No. 30 phosphorus bronze and 800 ft. No. 10 aluminum aerial wire; also several spark coils. Harry Weber, Canal Dover, Ohio.

ANYONE WISHING TO PURCHASE WIREless or electrical articles cheap will do well by writing me and arrange for some time to see same. State what you are after. Arthur Quattlander, 417-9 West 43d St., New York City.

FOR SALE—ONE ROBBINS & MEYERS Standard D. C. motor. ⅓ h.p.—2000 r.p.m.—110 v. 1.5 A. $10.00. 21 lbs. No. 28 D.C.C. copper magnet wire, 22 lbs. No. 12 D.C.C. copper magnet wire, $12.00. Irving T. Patridge, Milbank, S. D.

ONE ONLY—1 KW. TYPE C QUENCHED spark transmitting set ordered for one of our Central American customers which order was later canceled. Absolutely new. $225.00. Tropical Trading Co., New Orleans, La.

½ HORSEPOWER DIRECT CURRENT, 110 volt motor, good condition, $30. Can be used as dynamo. Knox Cooper, 339 Westminster Road, Rochester, N. Y.

1 COSMOS E. CO. ½ K.W. O. CORE TRANSformer, 2 J. J. Duck 1 qt. Leyden Jars, 1 New Halcun Rotary Spark Gap. First offer takes all. George A. French, 300 S. Hamilton St., Mobile, Ala.

ONE 1-KW., 10,000 VOLT CLOSED COIL transformer, price $20.00; one closed core transformer for quenched spark, price $15.00. Both new. Thomas Drury, 1214 Edgar St., Evansville, Ind.

1-INCH SPARK COIL, $2.75; 6-INCH FAN MOtor, $3.00; miniature electric railway and other apparatus; practically new. E. Eckhart, Kendallville, Ind.

FOR SALE—COMPLETE SENDING AND REceiving wireless outfit. Jos. Saggese, 997 Kent Ave., Brooklyn, N. Y.

FOR SALE—MOVING PICTURE FILMS. ANY subject, 1c per foot. Davis Service, Watertown, Wis. (2)

FOR SALE CHEAP—COMPLETE STATION. Send for particulars. L. Hamilton, Harvard, Ill.

$7.50 BUYS 15-MILE SENDING SET. ED WABRYCH, 349 Medbury Ave., Detroit, Mich.

A HIGH GRADE WIRELESS OUTFIT, $30.00. Arthur Haake, Closter, N. J.

DO YOU WANT THIS BOOK, WHICH TELLS you how to test and operate all different kinds of electrical apparatus, from generators and motors to lamps and bells? Only $1.50 postpaid. "Electricians' Operating and Testing Manual," by Henry C. Horstmann and Victor H. Tousley, 16mo., full leather, and chuck full of the right kind of information, which can be readily mastered by the layman as well as the experienced man. Modern Publishing Co., 231 Fulton St., New York. (tf)

INSTRUCTION

EXPERIMENTERS WHO DESIRE COMPLETE instructions for making a step-down transformer for experimental purposes, at small expense (that can be connected with ordinary house circuits) to send 25c for the best book ever issued on the subject. Great demand; everybody wants it. Better than batteries. Address, Engineering Education Extension, Lock Box 41, Hanover, N. H.

FREE TUITION BY MAIL—CIVIL SERVICE, mechanical drawing, stationary engineering, electric wiring, agriculture, poultry, normal, bookkeeping, shorthand and typewriting courses. For free tuition, apply Carnegie College, Rogers, Ohio. (r)★

FREE—ILLUSTRATED BOOK ON HYPNOTISM and other occult sciences to all who send their address. Write to-day and learn how to influence and control others. M. D. Betts, Sta. 174, Jackson, Mich. (r)★

WOULD YOU LIKE TO BE A PROFESSIONAL wireless man? Ex-operator will give you complete information regarding how to become a professional operator for 25 cents. J. C. Crowley, 605 Grand St., Troy, N. Y.

DOCTOR, BACHELOR, OTHER DEGREE courses; resident, non-resident. Address Vetus Academia, New Jersey Branch, Registered, 120 Palisade Ave., West Hoboken.

GOOD POSITIONS OPEN EVERYWHERE. Let us place you. State qualifications, salary, etc., first letter. "NISCO," Dept. MDF, Cincinnati. (10)★

HYPNOTISM PRACTICALLY TAUGHT AND demonstrated in class or private. Satisfaction guaranteed or money refunded. Ernestus School, Box 7, 954 Broadway, Brooklyn, N. Y.

BE A HANDCUFF KING! ENORMOUS SALaries paid. Full instructions 25c. Particulars free. Forsberg, 211 N. Second, Portland, Ore. ★

SOLDER WITHOUT HEAT. FULL DIRECtions, 25c. H. Mason, 218 Sherbrook St., Peterboro, Ont.

25 FORMULAS FOR 50C, RENEWING DRY Batteries. List free. Charles A. Lutz, Dept. F, York, Pa. (2)

GOOD BLACKSMITHS ARE SCARCE AND few learning the trade and the blacksmiths must make the tools for all—from surgeon to the safe blower. Buy Toy's Modern Methods Forging and Welding different kinds of steel solid, and doing all hard jobs easy, also hardening and tempering to a standard by colored charts. Any smith can be an expert that means good jobs and big money. All for one dollar. Send for valuable samples free. W. M. Toy, Sidney, Ohio. (r)★

"HOW TO MAKE WIRELESS INSTRUMENTS," by 20 Wireless Experts, containing 96 pages and 75 illustrations, written expressly for wireless amateurs, and is a book that you cannot afford to be without. Price, 25c postpaid. Modern Publishing Co., 231 Fulton St., New York City. (r)

MACHINERY

MODELS MADE FOR INVENTORS; GENERAL machine work; designing and perfecting; developing automatic devices and machinery. In a position to do all kind of light tool and machine work. Prices reasonable; estimates cheerfully given. Ideal Machine Works, 61 Ann St., New York City. (r)★

FREE CATALOGUE OF MODEL SUPPLIES. Castings, metal specialties on contract. North Chicago Tool Works, 2134 Grove Ave., North Chicago, Ill. (2)

"CONSTRUCTION OF INDUCTION COILS AND Transformers" is a valuable book, containing 100 pages and 72 illustrations, by H. W. Secor. You cannot afford to be without this book, which is the latest work on construction of induction coils and transformers. $.25 postpaid. Modern Publishing Co., 231 Fulton St., New York. (r)

Digitized by Google

MISCELLANEOUS

BUSINESS BUILDING SYSTEMS—FOLLOW-UP Record Card, keeps records of names, addresses, parcel post zone, letters sent, etc. Enough for 100 customers, prepaid 50c. 52 Model Advertisements for any line of business, only $1.00. Craftsman Advertising Signs, $1.50 up. Many other specialties—list free. Write Johnston Commercial Co., Carlinville, Ill.

POULTRY — WHITE ORPINGTONS, CELEbrated Cook strain; most popular breed in America. Eggs for hatching $2.50 per 15. Address J. E. Teal, 4913 Ravenswood Ave., Chicago. (2)

$5 SAFETY RAZOR FOR 25C (COIN). SATISfaction guaranteed or your 25c. will be returned to you, with 5c extra to pay postage. Send to-day. F. Rupert, 1505 Wells St., Fort Wayne, Ind.

WE ANALYZE EVERYTHING, FORMULAS furnished, chemical compounds manufactured in any quantity. Economy Laboratories, 721 East 161st St., New York.

YOUR 25-WORD ADVERTISEMENT ON thousands of our Big Desk Blotters only 50c. Best medium out. Address National Business Supply Co., 86 Bowles St., Springfield, Mass.

TOBACCO, THE PURE LEAF, NOT MANUFACtured. The best tobacco for chewing and smoking. Samples, one pound prepaid, 25c. Dolan & Co., 1135 Market, Louisville, Ky. (1)

SAFETY BLADES SHARPENED—GILLETTE'S, Duplex, all makes 2c each. Keene-Edge Co., Oshkosh, Wis.

MARK YOUR TOOLS, KNIFE BLADES, ETC., permanently, with a rubber stamp. Full particulars 25 cents. Tompkins, 608 Conley, Columbia, Mo.

WOULD YOU MARRY IF SUITED? BEST matrimonial paper published. Mailed free. The Correspondent, Toledo, Ohio. (1)

MARRY—MANY WEALTHY MEMBERS. WILL marry. All ages. Descriptions and photos Free. Box 314 C Z, Kansas City, Mo.

MARRY—MARRIAGE DIRECTORY WITH PHOtos and description. Free. Pay when married. New system. Box 525 E. B., Kansas City, Mo.

STORAGE BATTERIES ARE VERY HARD TO master and understand, but if you read this book you will know all about them from beginning to end. "Storage Batteries, Stationary and Portable," by J. T. Niblett, M.I.E.E. 80 pages, 21 illustrations, pocket size, silk cloth binding. Price, 50c postpaid. Modern Publishing Co., 231 Fulton St., New York. (tf)

PHOTOGRAPHY, CAMERAS & SUPPLIES

WE BUY, SELL AND EXCHANGE. BARGAINS in microscopes, telescopes, binoculars, cameras, etc. Bargain list sent. Kahn & Son, Opticians, 54 John St., New York. Established 62 years. (r)★

KODAKS, GRAFLEX CAMERAS, LENSES—Everything photographic; get bargain list. You can save money by sending your order to Willoughby, Broadway and 11th St., New York. (r)★

COLOR PHOTOGRAPHY. PRINT YOUR LANDscape in colors. Send 2 stamps for circulars. Isenmann, Photographer, 385 Bergen St., Newark, N. J.

500 BROWNIE ROLL FILM CAMERAS TO BE given away just for names. Drop us postal. Sun Photo Supply Co., Jamestown, N. Y.

44 LOVERS' CARDS AND BOOK OF TOASTS, 10c. A. Kraus, 409 M. Chestnut St., Milwaukee, Wis. ★

FIRST STEPS IN ELECTRICITY, OR ELECtricity for the Beginner! Doesn't that title sound interesting? It is just what it denotes, or maybe more, because it starts off with the development of electricity, explaining fully in a purely and descriptive manner how to perform simple experiments with as little expense as posible. 288 pages, 114 illustrations, pocket size, cloth cover. Price $1.00, postpaid. Modern Publishing Co., 231 Fulton St., New York. (tf)

PATENTS

PATENTS THAT PROTECT AND PAY—ADvice and books free. Highest references. Best results. Promptness assured. Send sketch or model for free search. Watson E. Coleman, Patent Lawyer, 624 F St., Washington, D. C. (r)★

PATENTS AND TRADEMARKS, ELECTRICAL and mechanical a specialty. Book free. Joshua R. H. Potts, Patent Lawyer, 8 Dearborn St., Chicago; 805 G St., Washington; 929 Chestnut St., Philadelphia. (8)★

INVENTORS WANTED—TO SUBMIT DEVICES for street railway transfer system; also other inventions. For particulars address Inventors' Mutual Development Association, 818 Potomac Bank Bldg., Washington, D. C. (1)

IDEAS WANTED—MANUFACTURERS ARE writing for patents procured through me. Three books with list, 200 inventions wanted. Sent free. Advice free. I get patent or no fee. R. B. Owen, 82 Owen Bldg., Washington, D. C.

OFFICIAL DRAWINGS FREE—PATENTS PROcured or fee returned. Expert services. Send sketch for free search. The Patent Exchange, Jerden Bldg., Washington, D. C.

PATENT YOUR INVENTION. $20,000 OFfered for inventions wanted. Booklet and opinion free. Milo B. Stevens & Co., Established 1864, 625 F St., Washington, D. C.

PATENTS WITHOUT ADVANCE ATTORNEY fee. Payable when patent allowed. Send sketch for free report. Books free. Fuller & Fuller, Washington, D. C.

WANTED IMMEDIATELY, INVENTIONS TO patent or commercialize. Advice free, A. P. Connor, Patent Attorney, Electrical Mechanical Engineer. Washington, D. C. (r)★

PATENT YOUR INVENTION—$20,000 OFFERED for inventions wanted. Booklet and opinion free. Milo B. Stevens & Co., Established 1864, 625 F St., Washington, D. C. (r)★

FREE—LIST OF PERSONS WHO WANT TO buy patents, prizes offered by manufacturers and lists needed inventions. Randolph & Co., 647 F St., Washington, D. C.

C. L. PARKER, PATENT ATTORNEY, 8 McGill Bldg., Washington, D. C. Inventor's handbook, "Protecting, Exploiting and Selling Inventions," sent free upon request. (r)★

BENJAMIN ROMAN, SOLICITOR OF AMERIcan and foreign patents; trade-marks registered. Patent treatise mailed upon request. 15 Park Row, New York. (1)★

WRITE FOR MY "WORDS OF VALUE TO INventors." John R. Woodworth, Registered Attorney, Worder Bldg., Washington, D. C.

1868—MIATT—PATENTS—1914—i.e., 46 YEARS' personal, practical and successful experience in procuring U. S. and Foreign Patents, Registration of Trade-Marks, Labels, Prints, Copyrights, etc. Also as Counsellor and Expert in Patent Causes. Personal attention given to all business assumed by mutual consent, but *only* on reasonable compensation for time and labor involved. Terms moderate, but not contingent. Information and advice freely given, but no circular literature. Branch Office, Washington, D. C., for transaction of business with Patent Office direct. Reliable and competent foreign representatives. Geo. W. Miatt, Attorney and Counsellor at Law and Patent Expert. Patent business exclusively. Offices, Temple Court, Cor. Nassau and Beekman Sts., New York City. (r)

PATENTS FOR SALE

PATENTS, COOKING UTENSILS, CHEAP. Mary E. French, Clyde, Ohio.

OUR 80-PAGE BOOK, "THE WIRELESS TELEphone," will be found invaluable to those interested in this science. This book contains 57 illustrations and is considered a masterpiece. Send $.25 in stamps, coin or M. O. to Modern Publishing Co., 231 Fulton St., New York City. (r)

Google

PICTURES AND POST CARDS

PANAMA CANAL POST CARD VIEWS mailed direct from Canal Zone to any address, 10c—3 for 25c. B. Curver, Box 858, Providence, R. I.

1000 WAYS GETTING RICH—BOOK CONTAINING 108 pages, 25c; 100 printed envelopes, 50c; Jolly Joker's Joke Book, 10c; 18 pretty postcards, 10c. Cycle Press, 1067 Jason, Denver, Colo.

24 ARTISTIC BEAUTY POSES, BEAUTIFUL woman, 10c. New 64-page book for gentlemen, 12c. Both 20c. Normal Specialty Co., M 7, Englewood, Chicago.

8 x 10 PHOTOGRAPH OF ARLINGTON RADIO Station and Towers (NAA), 25 cents. Hillers Photo Company, 238 First St., S. E., Washington, D. C.

MORE THE MERRIER, EVERYTHING CHEERier, pastime superior. Exchange postals. "True Blue" has perfect plan. Write E. Ed Ericson, Dept. M, Elroy, Wis.

ONE HUNDRED WAYS TO KISS A GIRL AND other things. Something real good. Price, 25 cents. Bronx Girls Club, 417 E. 151st St., New York.

25 COMIC POST CARDS AND BOOK OF FLIRtations, 10c. A. Kraus, 409 L. Chestnut St., Milwaukee, Wis. ★

FEMALE BEAUTY CARDS, REAL PHOTOgraphs. 5 for 25c. Maple Co., 181, Napanoch, N. Y.

FIVE CHARMING FEMALE BEAUTY CARDS, hand colored, 25c. Chas. D. Durso, 25 Mulberry St., New York.

30 NIFTY POST CARD VIEWS 10C. STEWART CO., Providence, R. I.

THREE ARTISTIC BEAUTY POSES, 10c. Taylor Bros., X, 2139 Clifton, Chicago.

PRINTING AND ENGRAVING

DIGNIFY YOUR CORRESPONDENCE. 100 LETterheads and envelopes printed on excellent bond, $1, prepaid. 500 letterheads or envelopes, $1.50. 1,000 for $2.50. Samples free. Proper printing. Robison Printery, Curwensville, Pa. (3)

1000 IMITATION TYPEWRITTEN LETTERS, heading black, body purple, bond paper, $3.00. All other printing low prices. Samples free. Good's Press, Harrisonburg, Va.

BUSINESS CARDS—100 NEAT CARDS, PRINTed, postpaid, 37c, 350 for $1.00. 15 years serving customers by mail. Amity Specialty Press, Card Dept., Amityville, N. Y.

PRINTING, 100 THREE KINDS, $1.50. LETterheads, noteheads, cards, statements, envelopes, tags. Moors & Co., 923 W. Madison, Chicago.

GUMMED LABELS, 3,000 $1.00. 1 x 2 INCHES. Catalogue Free. Helmus Company, Hoboken, N. J. (5)★

LEARN CUT-MAKING, $1. SPECIMEN 2C. Rex Print, Trenton, Mo.

WANTED ¼ KW. CLOSED CORE TRANSformer in exchange for 2 silicon detectors with silicon, 1 electrolytic detector, 1 Jr. fixed condenser, 2 double slide electro Jr. tuners, also a large assortment of telephones and parts, magnetos, receivers, transmitters, etc. Ralph Carnahan, 327 E. Church St., Urbana, Ohio.

WHAT AM I OFFERED IN EXCHANGE FOR a ¼ K. W. Holtzer-Cabot, Motor Generator with two rheostats, cost $90. A Wheatstone Bridge from 1 to 1,000,000 ohms. A Clapp-Eastham, Commercial Blitzen Tuning transformer, on marble base, cost $50. Am interested in large Victrola and records. J. F. Arnold, 243 East 118th St., New York.

I WISH TO TRADE A THREE-INCH SPARK coil, also a five-inch core, one 110 V. 60 C. ½ kw. transformer and one to be used with interrupters. Also have spark-gaps for each transformer. Desire receiving instruments. E. R. Hall, Peddie Inst., Hightstown, N. J.

REAL ESTATE

LET US SELL YOUR PROPERTY—ANYTHING. Bargains everywhere—inquiries daily. State particulars first letter. "NISCO," Dept. XDF, Cincinnati. (10) ★

FOR SALE: 60 ACRES OF FINE LAND, ON Grand Island, N. Y., fronting on the beautiful Niagara River, right across from Buffalo; suitable for high grade development, bungalow plots, gentleman's estate or farming; nearly 600 feet shore front with riparian rights; price $300 per acre; worth $500; liberal terms will be made with responsible parties; house and barns near shore. Address W. H. Northrop, Grand Island, Erie County, New York. (r)

THIS ELECTRICAL DICTIONARY WILL JUST fit in your vest pocket. Carry it around with you while you are at work. "Handy Vest Pocket Electrical Dictionary," by Wm. L. Weber, M.E., containing upwards of 4,800 words, terms and phrases employed in the electrical profession with their definitions given in the most comprehensive manner. Full leather cover 50c postpaid. Modern Publishing Co., 231 Fulton St., New York. (tf)

STAMPS, COINS, ETC.

$4.25 PAID FOR FLYING EAGLE CENT OF 1856. Hundreds of other coins bought. Send 10c for buying catalog. A. Kraus, 409 K. Chestnut St., Milwaukee, Wis. ★

OLD STAMPS BOUGHT—$75.00 PAID FOR a certain old stamp; hundreds of other stamps bought. Send stamp for buying list. A. Kraus, 108 Kraus Bldg., Milwaukee, Wis. ★

24 VARIETIES CUBAN STAMPS, 10 CENTS. List of 6,000 low-priced stamps free. Chambers Stamp Co., 111 L. Nassau St., New York City. (r)★

SEND NAMES OF THREE COLLECTORS AND receive packet of stamps, Free, catalog value 50c. H. B. Weir & Co., Springville, N. Y.

STAMPS—105 CHINA, ETC., STAMP DICtionary and list, 2c. A. Bullard, Sta. A., Boston, Mass. (1)

YOUR LIBRARY IS NOT COMPLETE WITHout a copy of Bound Volume No. 4 of Modern Electrics containing 958 pages, with over 1,000 illustrations and 1,200 questions and answers on topics of vital importance to you. Elegantly bound in black cloth; gold stamped. Our supply is limited, so order today while you think of it and you will not be disappointed. Price, 2.00; 40c extra by mail in U. S.; 75c extra in Canada. Modern Publishing Co., 231 Fulton St., New York, N. Y. (tf)

TELEGRAPHY

TELEGRAPHY — MORSE AND WIRELESS — Railway accounting (station agency) taught quickly. Railroad and Western Union wires and complete Marconi wireless station in school. Oldest and largest school. Expenses low—can earn part. Positions secured. Catalogue free. Dodge's Institute, Sixth St., Valparaiso, Ind. (5)★

WIRELESS, COMMERCIAL AND RAILROAD Telegraphy taught free by mail. Send for details. Brooklyn Telegraph School. W. U. Telegraph Bldg., 313 Fulton St., Brooklyn, N. Y. (9)★

TELEGRAPHERS' WORKING CONDITIONS, wage schedule, explained free. Pelnar School of Telegraphy, Madison, Wis. (4)

TYPEWRITERS

REMINGTON TYPEWRITER, GOOD ORDER, first $12 takes it. Edgewater Press, 1124 Foster Ave., Chicago. (2·

STORAGE BATTERIES ARE VERY HARD TO master and understand, but if you read this book you will know all about them from beginning to end. "Storage Batteries, Stationary and Portable," by J. T. Niblett, M.I.E.E. 80 pages, 21 illustrations, pocket size, silk cloth binding. Price, 50c postpaid. Modern Publishing Co., 231 Fulton St., New York. (tf)

Digitized by Google

WIRELESS

WIRELESS OPERATORS ATTENTION FOR February only. Silicon detectors, 65 cents. Send for one to-day. Butler & Miner, 318 N. Brown St., Madison, Wis.

COMMERCIAL AND PRIVATE STATIONS—Arlington Weather Chart, large size Chart for receiving weather and time signals. Very useful. Everybody's getting it. Orders filled promptly. Price 20c coin. Radio Chart Co., Box 345, Two Harbors, Minn.

WIRELESS AND EXPERIMENTERS' SUPplies. Look over our large catalogue and new supplement of our latest instruments. Condensers $.50 to $2.75. Detectors $1.75 to $4.00. Sent for 2c stamp. A. W. Bowman & Co., 55½ Sudbury St., Boston, Mass.

RAW MATERIAL, SLIDER ROD, BINDING posts, brass ribbon, impregnated paper pulp tubes, etc. Send for price list. Schenectady Wireless Supply Co., Schenectady, N. Y.

DETECTORS—THE FAMOUS D & W DETECtors for sale by us. Tested by experts. Adjustable to any mineral. Prices, $.50 and $1.00. Maximum Specialty Co., 306 College Ave., Ithaca, N. Y. (1)★

"WIRELESS HOOK-UPS," CONTAINING 96 pages and 100 hook-ups, is full of diagrams fully illustrating every possible wireless connection. This book will enable wireless men to get excellent results. Sent postpaid for $.25. Modern Publishing Co., 231 Fulton St., New York. (r)

PHOSPHOR BRONZE AERIAL WIRE — 42 strands No. 24, 2 c per foot. 21 strands, 1c per foot. 14 strands, 75c per hundred, 7 strand, 50c. C. Horton 904 Madison St., Brooklyn, N. Y.

WILL DISPOSE OF FINE LOT OF HIGHgrade wireless and electrical apparatus. Everything going cheap. Write for prices. H. E. Dill, Wollaston, Mass.

WIRELESS BLUE PRINT MAP OF ATLANTIC Coast stations, 20x28". Limited supply. 35 cents postpaid. Frank Reb, 1635 Gratiot Ave., Detroit, Mich.

WE CAN FURNISH ANY BOOK ON WIREless published. Write Book Dept., Modern Publishing Co., 231 Fulton St., New York. (r)

LONG DISTANCE, LOUDER RESULTS. SEND dime for special crystal detector attachment. Sterling Products Co., Box 61, Station L, Brooklyn, N. Y.

HAVE FOR EXCHANGE ¼ IN. SP. Coil, 2 spark gaps, electrolytic detector, tape recorder, ½ in. Bulldog type sp. coil, sending condenser, rheostat, 1/16 H. P. battery motor, detector, $7.50 perikon detector, $5 rotary printing press with type, automatic code teaching machine, coherer and decoherer, raw material, including binding posts, switch handles, rods, etc.; want pair good standard 2 to 4,000 ohm phones, or any receiving apparatus of Murdock or Clapp-Eastham make. Ben T. Elkins, St. Cloud, Fla.

WANT OFFER FOR 9½-IN. COILS, AUTOmatic gas lighting outfit, complete; Dietzen mechanical drawing outfit and pieces; helix with gap on top. 12 in. h. and 6 in. w.; 2 magnetos, 3 bar; 2 1000-ohm ringers; centigrade thermometer; 2 Rajah spark plugs, mercury, trouble finder lamp, telephone coil and condenser; desk bracket with socket; quartered oak box, 7 x 8 x 4 inches; 6 sockets, 5 wooden push buttons, 11 small nickel and pearl push buttons, 3 candelabras and 2 miniature sockets; want vest pocket kodak or any good film camera. D. Hutchinson, 504 West 157th St., New York.

WILL EXCHANGE RECEIVING OUTFIT, CONsisting of tuner, loading coil, 2 fixed condensers and silicon detector, for a good loose coupler, value about $8 or $9. Henry Muyskens, Jr., P. O. Box 194, Oak Harbor, Wash.

ONE EASTMAN FOLDING POCKET KODAK No. 3A, metal tripod with four sections, complete developing and printing outfit, portrait attachment, mounts, film clips, etc., cost $27 this summer, in exchange for a complete sending outfit, coil to operate on batteries. Must send 20 to 25 miles. Austin Publishing Co., 231 Fulton St., New York. (tf)

WANTED

WANTED—STUDENTS TO ENROLL IN ANother class in special electrical and college preparatory courses, beginning now; no entrance examinations. Write for Bulletin to Prof. F. E. Austin, 11 South Park, Hanover, N. H.

CASH PAID FOR SECOND-HAND MATERIALS, platinum, silver, quicksilver, bismuth, nickel, magnesium, cadmium, gas mantle dust, ores and chemicals and all similar goods. Josef Radnai, 86 Fulton St., New York City. ★

WILL TRADE NEW OMNIGRAPH, WORTH $4, and practically new book entitled Swoope's "Lessons in Practical Electricity," worth $2, for parts of receiving apparatus or instruments of Interstate Receiving Apparatus. Ralph H. Fleming, New Berlin, Ohio.

FOR EXCHANGE—D. C. FAN MOTOR, WITH rheostat and base, speed 2,500; would be fine for rotary gap up to one kw.; also one film pack camera and tank developing outfit. Complete outfit cost $12, with dark room lantern. Want commercial loose-coupler, variables, audion or other wireless goods. Prefer to deal with California amateurs, although will ship east. Marvin J. Hankins, 448 6th St., San Pedro, Cal.

WILL EXCHANGE COMPLETE SENDING OUTfit which will transmit 12 miles, for receiving instruments. Also have large D. C. motor to exchange for good loose coupler. S. A. Zichlin, 15 Ellery St., Brooklyn, N. Y.

WIIL TRADE OFF COMPLETE LATHE AND attachments for good sending and receiving set. Set must be at least worth $9. Albert St. Cyr, 319 Harrison St., Marquette, Mich.

SEVEN QUENCHED GAP PLATES, COSTING $7 and are in fine condition. Will exchange for good 110-volt A. C. motor, 3,000 R. P. M. or more; or for a good pair of Brandes phones or what have you? Paul E. Diederich, 915 E. Grand Blvd., Detroit, Mich.

WANTED—3,000-OHM HEAD SET, ROTARY variable receiving condenser, or good loading coil. Have for exchange: 1 Knapp type "S" dynamo-motor; 1 telephone transmitter; 1 10-in. Geissler tube, with liquid; 1 Mesco pony dynamo; 1 Exide 6 volt 60 ampere hour storage battery; 29 issues of *Electricion and Mechanic;* 16 issues of *Popular Electricity;* and 8 issues of *Modern Electrics.* Arthur Quattlander, 417-419 West 43d St., New York, N. Y.

A 6-VOLT, 120 A. H. STORAGE BATTERY FOR a 1 kw. transformer, either a Thordarson or type E. Also four Edison primary 100 A. H. batteries for a pair of 2,000-ohm receivers; state make. Elmer Freiwald, 1913 Helen Ave., Detroit, Mich.

HAVE NEW FERRON DETECTOR, $4.95; COMplete receiving set, large stepdown transformer, a $25 storage battery, $32 110 V. motor and $4.50 battery motor. Want wireless transformer, audion, variables, etc. Will exchange two pieces of selected black or blue carborundum crystals for piece of zincite, bornite or galena. P. H. Geiger, Sturgis, Mich.

HAVE A COMPLETE 5 x 7 CAMERA OUTFIT which cost in excess of $30, for exchange. Want a 10-amp. key; a good ½ kw. transformer or a rotary gap or what have you that will go with a ½-kw. set? Send stamp for list of articles. Calvin A. Sherman, 80 Camden St., Rockland, Me.

WILL EXCHANGE FOR A GOOD, PERFECT running motorcycle engine, a six-cylinder, $70 ignition coil; brand new $8 loose coupler; and a $9, 4 volt, 40 A. H., hard rubber cased storage battery (used half a year). Also other articles to exchange. L. A. Wolfe, 1706 N. 50th St., Seattle Washington.

WOULD LIKE TO EXCHANGE A PRINTING press and complete outfit, valued at $7, also a magic lantern and 48 slides valued at $3, for anything of equal value in the electrical line or that could be used in a chemical laboratory. George F. Moulton, 1117 Paul St., Ottawa, Ill.

WANTED—IN EXCHANGE FOR COMPLETE wireless outfit, worth $35, not used long; one motor, two dynamos and small storage battery of same value. Write to Maurice Pelgrims, 454 W. 35th St., New York.

Google

MODERN ELECTRICS AND MECHANICS

Apparatus Exchange Department

This department is for the free use of our subscribers and readers, to enable them to exchange technical articles for which they have no need for other articles or apparatus which they prefer.

Advertisements under this heading containing more than fifty words cannot be accepted; the right is reserved to rewrite or reject any advertisement which will not be for the best interests of our readers. Advertisements under this heading will be inserted one time only, free of charge.

Advertisements of articles intended for sale cannot be accepted, as a regular classified department is conducted for advertising of this character at a cost of 5c per word.

Advertisements should be addressed to "Apparatus Exchange Department," care *Modern Electrics and Mechanics*, 231 Fulton St., New York.

Advertisements for the April number should reach us on or before February 28th.

HAVE ¼-INCH COIL, 20 OHM TELEGRAPH set, miniature lamps, push buttons, beehive magneto buzzer, receiver and head band, 5-bar magneto, ammeter and volt-ammeter. Wish gravity and storage cells, battery parts, raw materials and photographic goods. Describe articles fully. S. Watson, R. F. D. No 1, Hillsboro, Oregon.

WISH TO EXCHANGE ONE 15-VOLT D. C. dynamo for a camera, Eastman preferred. Wm. Dwyer, Medina, N. D.

FOR EXCHANGE: ONE 25-MILE SENDING transformer of the closed core type, well made and in a case, for 3 lbs. of S. C. C. magnet wire and some tin foil. Geo. Soderstrom, Box 52 B, Bellevue, Wn.

ONE NO. 3 BROWNIE CAMERA, ONE SET of boxing gloves and bicycle minus tires in exchange for a good transformer. All above articles are in good condition. E. H. Kieser, Haverstraw, N. Y.

WANTED—1 H.P. ROTARY CONVERTER, D. C. to a. c., in exchange for wireless electrical apparatus; will add cash. William G. Brown, 946 Milwaukee Ave., Detroit, Mich.

HAVE TO EXCHANGE $1.25 BASEBALL catcher's mask, $1 baseball mitt, books, magazines, 4 sockets, $1.25 home-made sending condenser, home-made helix, woodwork for tuning coil and $3.50 roller skates; for rotary variable condensers, loading inductance key, detector, receivers or other wireless apparatus. P. O. Box 73, Lakeland, Fla.

WANT PHOTOGRAPHIC GOODS, ELECTRICAL articles, storage and gravity cells, magnet wire, dynamo, motor, omnigraph and raw materials; in exchange will give set of mechanical drafting instruments, value $13.50; six Edison cells, wireless receiver head set, ammeter $1.75, volt-ammeter $2.25, ¼-inch coil and drill chuck. Describe articles. Stanley Watson, Hillsboro, Oregon.

HAVE COMPLETE SENDING AND RECEIVing set, consisting of the following: Sending—key, spark coil, oscillation transformer, spark gap, glass plate condenser. Receiving—2000 ohm head phones, commercial loose coupler, loading coil, variable condenser, fixed condenser, several detectors, with extra minerals, buzzer test, aerial switch, ground switch, flexible cord for connections, insulators, tubes, etc. Will exchange for standard typewriter or late model motorcycle. Edward French, Peekskill, N. Y.

EXCHANGE — BATTERY, MOTOR AND FAN, electric engine, magneto, extension bell, door bell and push, telegraph sounder, learner's set, telephones, coils, plug board, battery shelves, transmitter arms, receivers, condensers, etc. Want auto transformer, 1 kw. generator, desk fan, flat iron, electrical or scientific books, wireless apparatus. A. C. Herman, Seymour, Mo.

HAVE A 12 H. P. GASOLINE ENGINE, TWO-cylinder, four-cycle, air-cooled, Shebler carbureter, tank and fittings, oilers, etc.; in exchange for a good sending wireless set or a closed core transformer or other wireless goods. Albert Massimo, Bellcourt, Bayside, L. I.

PHOTOGRAPHIC GOODS FOR EXCHANGE, comprising film premo No. 1, 3 x 5¼ inches, developing tank, card mounts, printing frames, chemicals, books and magazines. Want small pocket camera and outfit. Willard S. Wilder, 800 Eighth Ave., W. Ashland, Wis.

FOLDING CAMERA, STAMP ALBUM AND collection of 1,000 different stamps for Brandes Transatlantic wireless phones. George Reyl, 309 East 86th St., New York City.

WILL EXCHANGE COMPLETE SET OF ELECtric trains with transformer to run from electric light, cost $30, for $15 variometer or Clapp-Eastham loose coupler and Blitzen rotary variable condenser, or any wireless goods of equal value. Maurice L. Muhleman, Bronxville, N. Y.

MR. ELECTRICIAN: DO YOU KNOW ALL about wiring diagrams and descriptions? If not, you need this book, which is the latest out on the subject, "Modern Wiring Diagrams and Descriptions," by Henry C. Horstmann and Victor H. Tousley, 16 mo., 300 pages, 235 illustrations. Full leather binding, size 4 x 6 inches, pocket edition. Price, $1.50 postpaid. It explains dynamos and motors, alternating current and direct current, ground detectors and storage batteries, installations, etc. Modern Publishing Co., 231 Fulton St New York.

WILL EXCHANGE FOR ANYTHING ELECTRIcal or photographic or a pair of field or opera glasses, variable slide plate condenser, loading coil, ferron detector, large 2-slide tuning coil, 1-in. spark coil, strong battery motor, testing magneto, telephone extension bell, tattooing outfit and searchlight gas lamp. G. Morath, 534 John St., Kalamazoo, Mich.

WILL EXCHANGE ONE PAIR 2000 OHM phones with nickel head band and cords, complete, for 22 calibre repeating rifle. James J. Kertz, 248 Marion St., Brooklyn, N. Y.

WOULD LIKE TO GET ANY GOOD ELECTRIcal or wireless books. Write Maurice Winglemire, Holly, Mich.

YOUR LIBRARY IS NOT COMPLETE WITHout a copy of Bound Volume No. 4 of *Modern Electrics*, containing 958 pages, with over 1,600 illustrations and 1,300 questions and answers on topics of vital importance to you. Elegantly bound in black cloth; gold stamped. Our supply is limited, so order today while you think of it and you will not be disappointed. Price $3.00; 40c extra by mail in U. S.; 75c extra in Canada. Modern Publishing Co., 231 Fulton St., New York, N. Y.

WHAT HAVE YOU TO EXCHANGE FOR THE following articles: One-inch spark coil, an adjustable condenser, a muffled spark gap and one punching bag. Any one interested in this offer write W. C. Jamison, 244 West Washington St., Sullivan, Ind.

I HAVE A 110-VOLT D. C. MOTOR ABOUT 1-10 h.p. Will exchange for 110-volt a. c. motor, 60 cycle, single phase, of about same size. C. O. Middleton, 1812 East 11th St., Indianapolis, Ind.

PLATING DYNAMO, WITH ELECTRO PLATing and dip plating set in good condition, worth $25; 1 lb. No. 30 S. C. C. wire; 12 copies of mechanical magazine; 20 copies of *Modern Electrics*, from Feb., 1912, to date, and 4 x 5 plate camera. Want any high grade receiving apparatus, or what have you? H. Bibber, 31 Beacon St., Gloucester, Mass.

IT IS IMPORTANT THAT ALL INTERESTED in wireless should join the Wireless Association of America, which is helpful to those interested in any way in the wireless industry. For full particulars, address, Wireless Association of America, 231 Fulton St., New York. (tf)

I HAVE FOR EXCHANGE A LARGE POST card projector which throws post-card pictures, etc., on a large screen. Also "A" flat cornet. Will exchange for wireless apparatus. If interested, write. T. R. Earl, 712 Broadway, Niles, Mich.

Digitized by Google

I HAVE POSTAL TYPEWRITER WITH OAK cabinet, cost $40, 12 gauge gun, 200 phonograph records, medical battery, hundreds of *American, Everybody's, Munsey,* etc., magazines. Books of all kinds. Want high grade typewriter, 4 minute phono----h records, or plating outfit. W. Borchsenius, Nye, Wis.

WOULD LIKE TO EXCHANGE A BRAND NEW 1913 Reading Standard bicycle with coaster brake and non-skid tires, double trust frame; good as new; spring saddle, all complete, for a 1 kw. transformer or ½ kw. transformer with rotary or rotary quenched spark gap. J. G. Le Clair, 40 Irving St., Worcester, Mass.

"CONSTRUCTION OF INDUCTION COILS AND Transformers" is a valuable book, containing 100 pages and 72 illustrations, by H. W. Secor. You cannot afford to be without this book, which is the latest work on construction of induction coils and transformers. $0.25 postpaid. Modern Publishing Co., 231 Fulton St., New York City.

WILL EXCHANGE A 12-PLATE STORAGE battery, 6 v., 60 a.; one camera, No. 2 Brownie; one 20-ohm sounder; one snap switch, and a lot of cardboard tubes and rough stock. Want a typewriter or motorcycle, parts of any kind, or make me an offer. Charles Brown, 135 Bergen St., Brooklyn, N. Y.

SIXTEEN POUNDS NO. 20 SINGLE COTTON-covered copper wire, in two eight-pound coils. Will exchange whole or part for variable condensers, audion, antennium or stranded aerial wire, a. c. motor, a. c. voltmeter or a. c. ammeter—the latter preferred. Also have coarser wire and about 30 lbs. transformer iron. B. R. Mackey, 311 East Lancaster Ave., Wayne, Pa.

WILL EXCHANGE ½ KW. TRANSFORMER FOR a loose coupler; also other instruments. What have you? F. W. Henvis, 336 East Broad St., Richmond, Va.

I HAVE TWO BICYCLES AND A BUGLE with calls to exchange for a 2½-inch spark coil, helix, loose coupler, variable and fixed condensers, or any other wireless instruments. The bicycles are worth $20. Charles R. Green, 14th and Pebble Sts., Fremont, Neb.

WILL EXCHANGE A GOOD PUNCHING BAG and 100A switch blade and jaws for a rotary variable condenser, pair of 100 ohm phones or other receiving apparatus. Write, describing instruments, to D. H. Baker, 707 Monterey St., East Bakersfield, Cal.

WANTED IN EXCHANGE FOR A ½ KW. transformer coil: one pair Brandes "Superior" 2000 ohm phones and an electrolytic detector. Carroll M. Dunlop, Manchester, Iowa.

FOR EXCHANGE—LOOSE COUPLER, LOADING coil, perikon detector, 2000 ohm phones with double head bands, 2 Midget fixed condensers and 10 volt, 60 ampere storage battery. Want variable condenser and audion instruments. Charles Cohn, 208 Hart St., Brooklyn, N. Y.

MR. AMATEUR! TO LEARN ELECTRICITY you should start from the beginning. You should know all about the minor details before you take on the big ones, and here is the book that is going to take you all the way through. "Elementary Electricity Up-to-Date," by Sydney Aylmer Small, M.A.I.E.E., 12mo., cloth, 360 pages, 206 illustrations. Price, $1.25, postpaid. This book starts on the primary characters of electricity and goes clear through to the end. Tells you all about storage batteries, condensers, flow of current, power of efficiency, etc. Modern Publishing Co., 231 Fulton St., New York.

FOR EXCHANGE—ONE 20 OHM TELEGRAPH sounder and key mounted on mahogany base with brass binding posts, in exchange for a pistol flashlight. Also a one-inch coil, electrolytic interrupter, spark gap, slide plate receiving condenser, potentiometer and electrolytic detector. Will exchange for small dynamo. Fred Jacobs, Jr., Jerseyville, Ill.

HAVE FOR EXCHANGE: FIXED CONdenser, 50c; potentiometer $1.25; tuner, $2; battery motor, $1.25; a few pieces of galena; 4 ohm telegraph outfit, $1.75; Scientific American Reference Book, $1.50. What have you in the wireless line? Prefer one-inch spark coil. Kenneth Bailey, Southington, Conn.

WANTED — REPEATING RIFLE OR PUMP gun. Have for exchange an air-cooled spark gap in a porcelain-lined mahogany hexagon box, fully muffled, and pipes for blower, good up to 1 kilowatt, adjustable electrodes, and I also have a loosely coupled receiving set with a reputation; be quick. A. J. Funk, 226 W. Liberty St., Savannah, Ga.

WILL EXCHANGE FOR A MURDOCK PERIkon detector, Brandes head phones, Clapp-Eastham loose coupler, or any other instrument of quality, the following: Marlin repeater, 22 caliber; one set of "Encyclopedia Telegraphy and Telephony," and one Collins' Wireless Telephone Inductance System. Address all communicatons to John Hoff, 604 Communipaw Ave., Jersey City, N. J.

BOUND VOLUME NO. 8 OF "MODERN ELECtrics" is now ready, which contains 740 pages, over 1,000 illustrations and writings of 300 authors, 650 articles of unusual interest, with 1,178 questions and answers. Bound in handsome black cloth, gold stamped. $1.50; $0.80 extra by mail. Modern Publishing Co., 231 Fulton St., New York City. (tf)

FOR EXCHANE—A FINE ELECTRIC LIB . . books cost over $35, in fine condition. Consists of the following: "Electrical Engineer's Pocketbook," "Elementary Electricity and Magnetism," by Jackson, "Cyclopedia of Applied Electricity," 5 volumes, by the American Technical Society; "Electricity in Everyday Life," 3 volumes, by Houston, and "Handbook for Mechanics," by Smith. Will exchange all for incubator and brooder, or for large and good tent or sporting goods, and rifle or automatic revolver or bench drill, tools or Victor records. George H. Bones, 350 Park Ave., Weehawken, N. J.

TO EXCHANGE—ONE 150-OHM RELAY, LEGless key, one-wire switchboard, one desk telephone, two transmitters, two receivers, eight 2 m.f. condensers, one home-made loose coupler, a 5-inch Geisaler tube, a 6-volt motor, a small sending and receiving wireless outfit, a 6-inch, 4-jawed independent chuck, and a brass 8-chime whistle for air or steam. Want ¼ Blitzen transformer, Blitzen rotary receiving transformer, or alternating current motors 1-30 to 1-4, 110-60 cycle, or small gasoline engine, or what have you. C. I. Ways, 10 Hanover St., Cumberland,, Md.

BOOKS, AS A RULE, ARE FILLED UP WITH technicalities and are of very little use to the experimenter, but here is a book which is simple, plain and understandable. Send your order at once for your copy of "Electricity Made Simple," Clarke Caryl Haskins, 233 pages, 108 illustrations, 12mo., cloth binding. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

HAVE A SCIENTIFICALLY RATED COIL SAID to develop 1 kilowatt; will exchange for audion detector, a Tesla coil and static machine. I also have a lineman's transmitter and receiver valued at $6.50, which I will exchange for a variable condenser, potentiometer and fixed condenser. Also have a small step-down transformer which I will exchange for an electrolytic rectifier, geisaler tubes or small ammeter. Ward Balkwill, 1808 East 82d St. Cleveand, Ohio.

HAVE TELEPHONE AND PARTS, 10-INCH geissler tube, several electro magnets, lightning arresters, electric clock, professional silicon detector, loose coupler, loading coil, No. 36 s.s.c. wire, shotgun, 2 kw. quenched gap, 2 kw. rotary ½ kw. transformer coil, sending condenser, key and 200 meter oscillation transformer. Want a visible typewriter, Blitzen wavemeter, Blitzen loose coupler or omnigraph. F. H. Korab, 1210 Master St., Philadelphia, Pa.

THIS ELECTRICAL DICTIONARY WILL JUST fit in your vest pocket. Carry it around with you while you are at work. "Handy Vest Pocket Electrical Dictionary," by Wm. L. Weber, M.E., containing upwards of 4,800 words, terms and phrases employed in the electrical profession with their definitions given in the most comprehensive manner. Full leather cover; 50c postpaid. Modern Publishing Co., 231 Fulton St., New York.

WILL EXCHANGE—ONE PAIR 1000 OHM REceivers; 1 spark coil sending condenser; 1 pint leyden jar; 1 100-ampere lightning switch; 1 D.P.D.T. 30-ampere lightning switch; 1 D.P.D.T. 15-ampere lightning switch; 1 battery motor, and 1 little shocking machine, for rotary spark gap or audion detector. Wallace or Blitzen make, or anything of the same value. J. G. LeClair, 40 Irving St., Worcester, Mass.

Google

WANTED—GOOD OMNIGRAPH WITH RECords; also 500-cycle motor generator, for which I have a set of wireless phones with rubber head band, photographic books, cameras and lenses, or will pay cash. George E. Adams, 45 Whitaker St., Savannah, Ga.

WILL EXCHANGE: 75 OHM. RECEIVER, 15 insulators, woodburning outfit, brass outfit, 10 pieces sensitive galena, 10 issues *Modern Electrics*, etc., for about 400 feet bell wire and 400 feet aluminum wire No. 14, or what have you? L. Rohrecker, 430 East 85th St., New York.

THE PROCESS OF TRANSMITTING WIRELESS messages through the air over long distances by the aid of electricity is to countless thousands of people only a mysterious fairy tale, but here is a book for you, Mr. Operator, which states nothing but cold facts. "Operators' Wireless Telegraph and Telephone Hand Book," by Victor H. Laughter, 12mo., 210 pages, fully illustrated, giving the operator all the information he desires. Price $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

WILL EXCHANGE TWO WELL-KNOWN makes of automobile coils for a loose coupler or a double slide tuning coil. T. L. Hanna, 118 West Plume St., Norfolk, Va.

EDISON KINETOSCOPE, FILMS, SLIDES, rheostat and lamp. Will exchange in whole or part for wireless set or equipment. Paul T. Trueman, 7 Westwood Rd., Somerville, Mass.

I HAVE FOR SALE THE FOLLOWING APPAratus: Sensitive perikon detector $1.50, a high grade very sensitive galvanometer $2, 2000 meter loading coil $2, electrolytic detector and resistance for same $1.25, adjustable sending condenser 1 to 10 plates $1.50, ¼-inch spark coil $2, 50-watt step-down transformer 110 v. to 10 v $2, battery gage $0.75, plates for 6-60 storage cell $4, magneto rewound to 8 volts $1.25, 100 ft. double connector telephone cord in one piece $1.50, and an automatic gas lighter in good condition $1. Would prefer 110 volt and ammeters and low reading meters, rotary variable condenser. Write me if you have anything in the electric line, as I have other things. P. H. Markmann, Jr., 3004 N. Franklin St., Philadelphia, Pa.

LEARN TO FLY—BIG TWO-FOOT BLERIOT Monoplane. Latest model, knocked down, packed, ready for mailing, with blue print and complete drawings for assembling, with wheels and propeller. This model is usually sold by dealers for $2.00. Boys all over the country are having barrels of fun with them. For good, wholesome amusement, there is probably no flying device more entertaining and that will afford more fun for the boys and grown-ups than this pleasing toy. Guaranteed to fly or money refunded. Sent prepaid on receipt of price, $1.00. Model Flying Machine Company, 179 Greenwich St., New York City.

WANTED—SPARK COIL OVER ¼ INCH, DEtector and spark gap. Have for exchange miniature job printing press, 4 sets type and full equipment. Prints 3½ x 1½ inch. Also good telescope and large telephone magnet. All in good condition. Harry Hennequin, 719 12th St., Saskatoon, Sask., Canada.

WILL EXCHANGE ONE MOTOR CYCLE ENgine or motorcycle needing repairs for a good cornet (B flat), or technical books on electric lighting to the value of $30. Roy Curtis, Minden, Nebr.

FIRST STEPS IN ELECTRICITY, OR ELECtricity for the Beginner! Doesn't that title sound interesting? It is just what it denotes, or maybe more, because it starts off with the development of electricity, explaining fully in a purely descriptive manner how to perform simple experiments with as little expense as possible. 382 pages, 114 illustrations, pocket size, cloth cover. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York City.

WILL EXCHANGE A $14 OMNIGRAPH, A $5 selenium cell that works fine, a 3 h.p. gasoline engine in fine condition, a United type helix, and an American typewriter for a good drawing set, Knapp type "S" dynamo, audion detector, a good telephone transmitter or a ¼ h.p. gasoline engine. Samuel Cohen, 242 Hinsdale St., Brooklyn, N. Y.

HAVE BRAND NEW PREMO CAMERA, SIZE 2¼ x 3¼, box type, and "Telegraph Instructor" to exchange for type S dynamo motor or spark coil. G. Spurlock, Hammon, Okla.

I HAVE FOR EXCHANGE 1 LEGLESS TELEgraph key and a 2-in. wireless spark coil. Would like a 1½-in. wireless spark coil, of either J. J. Duck or I. W. T. make. Merle Cobb, R. 2, Box 79, Elkhorn, Wis.

WILL EXCHANGE ONE INCH SPARK COIL, costing $4.25; one home-made loose coupler, cost $6; one sending key, cost $1.25; a spark gap costing $.60, and ½ lb. of cotton-covered wire, size 36, costing $.85, for talking machine. I will pay all charges on exchanged goods both ways. Herbert L. Walsh, Niagara-on-the-Lake, Ontario, Canada.

HAVE ¼-IN. SPARK COIL IN GOOD CONDItion to exchange for reliable mineral detector or tubular or rotary variable condenser. Robt. Ruedy, 306 Burlington St., Mendota, Ill.

I HAVE A $5 MAGNETO AND A SMALL BATtery motor worth $1.50 to exchange for a good tuning coil and condenser. Ralph Wolfinger, 716 South State St., Marion, Ohio.

I HAVE 1-INCH SPARK COIL, two small leyden jars, zinc spark gap, brass ribbon helix, and key. Wanted: Three slide tuning coil or loose coupler and rotary variable condenser. James T. Ewert, Jr., 248 Grand River Ave., Detroit, Mich.

YOU CAN TURN YOUR SPARE TIME INTO dollars by taking subscriptions from your friends and acquaintances. You as a regular reader of Modern Electrics and Mechanics know its good points and can present its attractive features in a way which will readily make subscribers of your friends and acquaintances. Convince me that you are in earnest and willing to push things; send me the endorsement of three responsible business men who are willing to vouch for your fitness and I'll gladly send you your official appointment papers, together with full particulars as to how to go about the work, and how much there is in it for you. Don't delay until some one else in your territory has secured the appointment. Write your application to-day. M. C. Cooney, Manager Local Agents Department, Modern Publishing Co., 231 Fulton St., New York City.

WILL TRADE ¼ K.W. TRANSFORMER OF reliable make for valve detector, Wallace or Radio Telephone Co.'s preferred, and a pair of 2400 or 3000 ohm phones; transformer in perfect condition. N. E. Blackie, 110 Norfolk St., Dorchester, Mass.

HAVE A COMPLETE ELECTRICAL RAILROAD outfit; also have a 35 ohm relay and a Geissler tube. What have you to offer for them? Arthur Haake, Closter, Bergen County, N. J.

WANT TO EXCHANGE GENERAL STORE goods for typewriters, any good make; also want a phonograph and records. Send by prepaid express and I will send goods. Have books, medicine, jewelry, toilet goods, etc. C. J. Budlong, Box 94, Sound View, Cal.

HAVE TO EXCHANGE FOR A CLOSED CORE transformer or a large spark coil the following: 1 bicycle; 12 volt dynamo; 22 calibre rifle; a bell-ringing transformer and 1-inch spark coil. Frank Devide, 386 East 138th St., New York.

FOR EXCHANGE—THE FOLLOWING BOOKS: Homan's "Self-Propelled Vehicles," "Elementary Electricity," "Easy Electrical Experiments," "Dynamos and Electric Motors and All About Them," and Dodge's "Telegraph Instruction." Will exchange for other books, or what have you? G. H. Petersen, 912 Washington St., Moscow, Idaho.

HAVE TUNING COIL, DETECTOR, BELLS, 6 v. 16 c.p. Mazda lamps, Empire cloth, snap switch, 10 in. carborundum wheel, attachment plug, Edison fuses, etc. Want battery motors, film camera, rotary gap wheel, electrician's tools, typewriter, or what have you? Albert G. Weinsz, 327 West 4th St., Canal Dover, Ohio.

I AM WILLING TO TRADE THE FOLLOWing articles: 1 double slide tuner, cost $2.50; 1 "catwhisker" detector, cost 95c; 1 large fixed condenser, cost $1.25; 1 small condenser (necessary), cost 75c; 1 ear phone, head band and cord, cost $1.75; 1-inch spark coil, cost $4.50; key, cost $1; spark gap, 75c. All articles are practically new. Peter E. Lust, 1124 Chillicothe St., Portsmouth, Ohio.

Google

HAVE MASSIE RECEIVING SET WITH WAVE meter, in fine condition, cost $15. What do you offer? Have also a Splitdorf magnetic leakage type spark coil without case or interrupter. Gives about 2-inch spark with electrolytic interrupter. Will exchange for anything in wireless. Frank Reb, 1635 Gratiot Ave., Detroit, Mich.

TO TRADE—ONE 1-KW. WIRELESS SET, COMplete, for good Harley Davidson or Excelsior motorcycle. Set tested, sending 200 miles, receiving 2500. A. H. Arthur, Dowagiac, Mich.

HAVE A TWENTIETH CENTURY SNARE drum, value $25, which I will exchange for a wireless spark coil or a step-down transformer for 110 voltage. Jack Lorenz, 2510 East 21st St., Oakland, Cal.

5 x 12 IN. BENCH LATHE, SLIDE RE. . AND cutters, Universal chuck, etc.; graphophone record trimmer, and approved type 12 h.p. auto engine, complete. Want jeweler's lathe, twin motorcycle, engine, or steam engine and boiler, complete. Jas. Pesek, Schuyler, Neb.

HAVE A MAGNETO GENERATOR, IN GOOD condition. Will exchange for 1-inch spark coil or static machine. William Daly, 30 Beaver St., New Britain, Conn.

WILL EXCHANGE A SMALL MODEL AEROplane and over 50 ft. of No. 14 black enameled wire for a wireless key. Send the key, and the aeroplane and wire will be forwarded at once, postpaid. Andrew L. Shafer, Scott, Ohio.

HAVE FOR EXCHANGE 1 SCROLL SAW, FOOT power, saws up to 3 in. thick, used for no longer than 10 hours, cost $31.50. Wish a foot power iron lathe or small gasoline engine. Also small battery motor, 6 v., a Little Hustler motor, a medical coil, and mechanical train and track, value $10, which I will exchange for small dynamo, or what have you? Jas. B. Root, R. F. D. 3, Reinholds Station, Pa.

WILL EXCHANGE COMPLETE TRANSMITTING set, consisting of ¼ kw. closed core, self-regulating transformer, quenched gap, condenser, and No. 2 aluminum wire helix, for receiving instruments or other articles actually worth $6. A. R. Harris, 403 North Walnut St., Cameron, Mo.

WILL EXCHANGE A 1-INCH WIRELESS COIL, complete, for an omnigraph with spring motor. Also have coherer and decoherer, volt-ammeter, telephone coil and transmitter. Also extension bell and 3 magnet generator. Can use a ¼ or½ inch spark coil. Also have a graphophone and records, and photographic supplies. W. J. Baker, Clayton, Ohio.

IN THIS VALUABLE BOOK WILL BE FOUND everything that is necessary for the study of telegraphy. Rules are given for the guidance of operators in all different kinds of services, and they are very clear and comprehensive. "Telegraphy Self-Taught; A Complete Manual of Instruction," by Theo. A. Edison, M. A., 12mo., 170 pages, fully illustrated. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

WHAT HAVE YOU TO EXCHANGE FOR ⅛ h.p. water motor, small toy electric motor, and dynamotor. M. Binis, 177 Lovejoy St., Buffalo, N. Y.

WILL EXCHANGE 50 FEET NO. 4 RUBBER covered wire for Brandes Superior receivers, or 800 feet No. 14 bare copper wire. Must be in good condition. Mark Slabodnik, Box 480, Ely, Minn.

TO EXCHANGE—STAMP COLLECTION, DRAWing instruments and board; parts of loose coupler; 300 feet antenna wire; 125 feet annunciator wire, 1 lb. No. 28 enameled wire, electrolytic and silicon detectors, 75 ohm receiver and cord, silicon and galena, small parts, books, etc., for a typewriter, kodak, 3000 ohm phones. H. F. Hodder, Ponsford, Minn.

HAVE FOR EXCHANGE ALL PARTS OF ½ kw. closed core transformers, minus empire cloth, value $12; want Brandes Navy phones or ¼ kw. closed core transformer or loose coupler; all must be in good condition. Malcolm McKay, Box 202, Temple, Texas.

WILL EXCHANGE ONE ½ KW. COIL WITH vibrator, and one electrolytic interrupter, for goods of equal value. Would like an Amco humming transformer. Myron Chace, 46 Beaver St., Worcester, Mass.

WANTED—AN ELECTRIC BOX FLASHLIGHT in exchange for a Bell electric flashlight, which is valued at $5. Gilbert Feldstein, Lake Placid, N. Y.

HAVE A 22-CALIBER WINCHESTER REPEATing rifle and complete developing outht for plates and films in exchange for lathe, rheostat, motor for 110 volts a. c., or step-down transformer. Harvey Bell, 2103 Columbia Ave., Indianapolis, Ind.

WANT TO EXCHANGE FOR WIRELESS goods the following: Electric railway, comprising two engines and tender, baggage coach, passenger coach, caboose, trolley car, 50-foot track and two switches. Outfit cost $24.75. Can be used on d. c. or batteries. In good order. Also banjo, worth $5. Harry G. Miller, 1526 Second Ave., York, Pa.

I HAVE THE FOLLOWING INSTRUMENTS for exchange: A perikon detector with crystals, a silicon $2.50 detector, a U. type carborundum detector, a ferron, two head sets, each 2000 ohm, a magneto, a battery motor, air rifle, No. 1a folding pocket kodak, and many marble bases. What have you? Maurice Winglemire, Holly, Mich.

WILL EXCHANGE 1000 OHM RECEIVER, 500 ohm receiver, 75 ohm receiver, two-slide tuning coil, home made loose coupler, Standard detector, home made 21-plate variable condenser and home made detector. I also have other electrical goods to exchange. Best offer takes them. Walter Ryan, 11 Tibbetts St., Natick, Mass.

WILL EXCHANGE 1 PAIR OF 2000 OHM phones, complete, worth $6.35, and 150 ohm Bunnell sounding relay, for Remington typewriter or double barrel shotgun. Also 1 Slaby-Arco coherer and decoherer and 100 ohm Bunnell relay for repeating rifle. James J. Kertz, 248 Marion St., Brooklyn, N. Y.

I HAVE A 1-16 H.P. MOTOR AND SMALL dynamo. Will trade for anything in the wireless line. Jacob Hanselman, 65 Laffverty Ave., Pittsburg, Pa.

FOR TRADE—THREE PORTABLE RECEIVING sets, a loose-coupler, a battery telephone, two gaps, transmitting set, learner's telegraph, railroad relay, pocket relay, coherer, 2000 head set, 3000 head set, —battery motor, table portable lamp, condenser, and two books. What have you? E. R. Hough, Johnstown, N. Y.

HAVE POST CARD KODAK AND EQUIPMENT, cost $40; fishing outfit, $9; Giant sounder, $3; loading coils, $3.75; magic lantern, baseball outfit and six insulators. Will exchange for 1 kw. sending outfit or instruments; rotary variable condenser, audion, or stranded copper aerial wire. Roy C. Burr, 68 East Elm St., Norwalk, Ohio.

WILL EXCHANGE A COMPLETE HOME study course in medical electricity and electro-therapeutics, as given by the National College of Electro-Therapeutics, together with textbooks, for a medical coil or any kind of electro-medical apparatus. Write Frank L. Steele, Gloversville, N. Y.

A BARGAIN—THREE LBS. OF NO. 36 D. C. C. copper wire and an electric interrupter. Will exchange for a pair of Brandes long distance receivers, Superior type, and something else, or a pair of Transatlantic type phones. V. Stableford, Yale, Mich.

HAVE ONE 5-INCH COIL TO EXCHANGE FOR anything in wireless line. Gives fat, hot spark on interrupter. No current in residence. What have you A. J. Carver, 4 Warring Ave., Buffalo, N. Y.

JUST OFF THE PRESS — BOUND VOLUME No. 5 of Modern Electrics; contains more real information than is found in $50.00 worth of electrical books; 1,344 pages; 2,100 illustrations; 1,650 questions and answers. A veritable encyclopedia on electricity. If you are a student of electricity or desire to keep in touch with the electrical progress of the world you can't afford to be without this wonderful collection of data on inventions, illustrations and writings of leading authors from every part of the world. Positively only 39 sets left. Orders will be filled as received and money returned when supply is exhausted. Price $3.00; 65c extra by mail in U. S.; 95c extra in Canada. Modern Publishing Co., 231 Fulton St., New York, N. Y.

WILL EXCHANGE FINE BIDWELL SELENIUM cell, costing $40, for ½ h.p., 110 v. 60 cycle motor, or 100 amp., a. c. amperemeter, or 250 volt a. c. voltmeter. H. T. Talley, Belvedere Hotel, Denver, Col.

Google

NEW HOME STUDY BOOKS

HOUSE WIRING. By Thomas W. Poppe.

This work describes and illustrates the actual installation of Electric Light Wiring, the manner in which the work should be done, and the method of doing it. It is intended for the Electrician, Helper and Apprentice. It solves all Wiring Problems, and contains nothing that conflicts with the rulings of the National Board of Fire Underwriters. It gives just the information essential to the Successful Wiring of a Building. Among the subjects treated are: Locating the Meter. Panel Boards. Switches. Fixture Receptacles. Brackets. Ceiling Fixtures. The Meter Connections. The Feed Wires. The Steel Armored Cable System. The Flexible Steel Conduit System. The Ridig Conduit System. A digest of the National Board of Fire Underwriters' rules relating to metallic wiring systems. Various switching arrangements explained and diagrammed. The easiest method of testing the Three and Four-way circuits explained. The grounding of all metallic wiring systems and the reason for doing so shown and explained. The insulation of the metal parts of lamp fixtures and the reason for the same described and illustrated. 125 pages. Fully illustrated. Flexible cloth. Price.....50 cents

DYNAMO BUILDING FOR AMATEURS, OR HOW TO CONSTRUCT FIFTY-WATT DYNAMO.

By Arthur J. Weed, Member of N. Y. Electrical Society.

A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings showing the actual construction of the different parts. Price, paper, 50 cents. Cloth.....$1.00

TELEPHONE CONSTRUCTION, INSTALLATION, WIRING, OPERATION AND MAINTENANCE.

By W. H. Radcliffe and H. C. Cushing.

This book gives the principles of construction and operation of both the Bell and Independent instruments; approved methods of installing and wiring them; the means of protecting them from lightning and abnormal currents; their connection together for operation as series or bridging stations; and rules for their inspection and maintenance. Line wiring and the wiring and operation of special telephone systems are also treated.

Intricate mathematics are avoided, and all apparatus, circuits and systems are thoroughly described. The appendix contains definitions of units and terms used in the text. Selected wiring tables, which are very helpful, are also included. 100 pages, 125 illustrations.....$1.00

Any of the above books sent postpaid on receipt of price.

MODERN PUBLISHING CO., 231 Fulton St., NEW YORK

A $1.00 Safety Razor FREE!

WITH TWO YEARS' SUBSCRIPTION TO MODERN ELECTRICS AND MACHANICS

You Save 100%

RANDALL SAFETY RAZOR and 12 blades, $1.00
MODERN ELECTRICS AND MACHANICS two years 3.00
Total.. 4.00
Our "GET ACQUANTED" Offer, both for 2.00
SAVING $2.00

This RANDALL SAFETY RAZOR which retails regularly at $1.00, consists of:—

The Randall Razor Frame which is made of brass, heavily nickel-plated.

Twelve Blades given FREE with each set, represent the highest perfection in manufacturing, being made of the highest tempered steel, skillfully ground and honed to the keenest edge.

The Case is almost identical to those supplied with the standard safety razors sold at higher prices. It is of chase leather, with a special fastening device to lock it, and is lined with a rich plush.

This Combination has created what is to-day recognized as the simplest, most useful and practical safety razor yet devised irrespective of price, and is given with the IRON CLAD GUARANTEE that if it does not give satisfaction in every respect your money will be refunded without a word.

This Razor Given Absolutely FREE with Two Years' Subscription to MODERN ELECTRICS AND MACHANICS

MODERN ELECTRICS AND MACHANICS

The brightest and Most Interesting Electrical and Mechanical Magazine Published. With New Departments on topics of general interest. Containing 148 to 196 pages monthly, written in a popular style to interest and to be understood by everybody.

The Magazine to Read if you want to keep up to date on Wireless and progress in electricity and mechanics. ACCEPT NOW *this unusual offer and mail Coupon* TO-DAY. Add 16c. for mailing and packing razor.

15c per Copy
$1.50 per Year

MODERN PUB. CO., 231 Fulton St., New York.
Enclosed find $1.16 (cash, stamps or M. O.), for which send me prepaid one Standard Randall Safety Razor on terms described in this advertisement and Modern Electrics & Mechanics for two years to the address below.

Name.....
Street.....
City and State.....
Note—For N. Y. City or Canada add 10c; Foreign, $1.25

Digitized by Google

GIVE YOUR BRAIN A Full Course "Feed"

Like the "breakfast foods" — of fame — there's **Knowledge, Strength, Earning-Power,** for you, in ELECTROFORCE—

A REAL MAGAZINE

THE KIND YOU WERE LOOKING FOR

Many pages of **real reading—Practical Education,** cleverly combined with **real entertainment**—for easy digestion and assimilation—stimulating **mind** and **effort.**

A "preparatory course," fitting you for intelligent understanding of the **big things of life**—a "post graduate" if you've already had an opportunity to study them.

Nothing **cheap** or **trashy,** but **good to the core**—and, like the school boy with the apple—when you're through, there **"ain't going' to be no core."**

Doesn't this "MENU" SOUND GOOD?

All that its name implies—and **so much more** that you will truly be **surprised** and **delighted** with

ELECTROFORCE

Unusually attractive is **Electroforce—clean and bright**—carefully, thoughtfully and systematically edited (not only in **reading matter pages,** but in **advertising section**)—nothing that we are doubtful of, or would hesitate to place in the publisher's own family.

So many helpful suggestions—and you'll be **surprised** at how much **real value** some of them will be to you. It costs money to publish a magazine like ELECTROFORCE—but during 1914 we will give our readers the **biggest value for $1.00 that they ever purchased. Really—you can't get the first number on the way to YOUR ADDRESS too soon.**

You can afford **two cents a week** for an electrical education, the price of one red postage stamp. Well then subscribe now—$1.00 for a whole year (12 big issues.)

YOU'LL BE GLAD YOU DID

DOWN to the minute Special Articles on Electrical and Allied Subjects—

- Electricity for Beginners
- Wireless Telegraphy
- Telephony, Engineering
- Natural Electricity
- Electrical Cooking
- Electrically Operated Pontoon Cranes
- Electrical Wiring
- How a Three-heat Switch is Wired
- The House of a Thousand Electrical Features
- How Motor Starters Operate
- Queer Incidents and Happenings
- Electrical Terms Made Clear
- Signal Outfits
- Refrigeration
- Vacuum Cleaning
- Electro-Chemistry
- Street Illumination
- Household Electricity
- Welding
- Motors and Equipment
- Magnetism
- Noted Men
- Question Box

In fact, Everything that is GOOD TO READ

Twenty-Five Cents, for Three Months For those who have to "be shown" we are making a **Special Offer**—a three month's subscription to ELECTROFORCE for twenty-five cents. ELECTROFORCE is a thorough electrical education for anyone. Get ELECTROFORCE for yourself, or for your son. You will never find a better value for 25c. Address

ELECTROFORCE PUBLISHING CO. Stroh Bldg., 171 Michigan Street MILWAUKEE, WIS.

Google

9,059-Word Business Book Free

Simply send us a postal and ask for our free illustrated 9,059-word Business Book which tells how priceless Business Experience, squeezed from the lives of 112 big, broad, brainy business men may be made yours—yours to boost your salary, to increase your profits. This free book deals with

—How to manage a business
—How to sell goods
—How to get money by mail
—How to buy at rock-bottom
—How to collect money
—How to stop cost leaks
—How to train and handle men
—How to get and hold a position
—How to advertise a business
—How to devise office methods

Sending for this free book binds you to nothing, involves you in no obligation, yet it may be the means of starting you on a broader career. Surely you will not deny yourself this privilege, when it involves only the risk of a postal—a penny! Simply say, "Send on your 9,059-word Book." Send to

SYSTEM, Dept. 10, Wabash & Madison, Chicago

A BEAUTY—No. 1250. Cost $3,600

KEITH'S

BIG $2. OFFER FOR THE HOMEBUILDER

ARTISTIC ideas, unique plans and practical Homebuilder helps, to be found in the 80-page monthly numbers of KEITH'S MAGAZINE (established 14 years), the recognized authority on Planning, Building and Interior Decorating, Homes of Moderate Cost. You will want this excellent Homebuilder's Magazine, each issue contains 6 to 10 House Plans. Subscription $2 a year. Single copies at news stands.

OUR BIG OFFER—To each subscriber sending $2 we will mail postpaid, any one of

KEITH'S FAMOUS DOLLAR PLAN BOOKS.

130 Plans of Bungalows.
104 " " Cottages.
125 " costing below $4000.
175 " " " $5000.
175 Plans costing below $6000.
125 " " over $6000.
100 " Cement and Brick.
50 Garages, 40 Duplex and Flats.

M. L. KEITH, 621 McKnight Bldg., Minneapolis, Minn.

This book contains 750 pages, tables, charts, etc., and over 900 illustrations and diagrams. Printed on thin paper and bound in flexible leather with gold stamped title. Pocket size.

PRICE $3.00

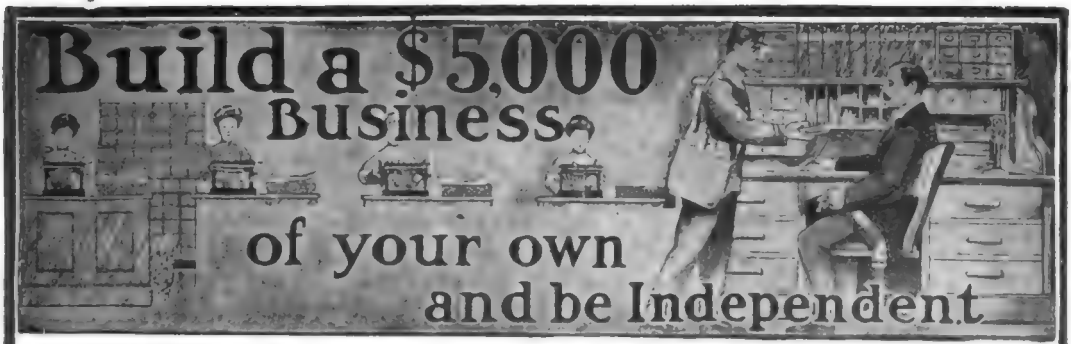
HERE IT IS AT LAST!

A new handbook for the practical electrical man that is beyond any doubt the most complete book of its kind ever published. It is intended for men who run the power plants, handle the machinery, wire the buildings, set up and operate dynamos, motors and transformers, install lighting systems, etc., etc. It has been dedicated to the great body of practical men who carry out the designs and plans of the electrical engineer.

AMERICAN ELECTRICIAN'S HANDBOOK

is divided into six main sections: I. FUNDAMENTALS—A reference section on principles of electricity and electrical engineering. II. GENERATORS AND MOTORS—Characteristics and Management—Troubles and Remedies—Direct and Alternating Current Machinery—Starting and Controlling Devices—Installation. III. DISTRIBUTION—Pole Lines—Underground Conduits—Transformers—Designs of Systems, etc. IV. INSIDE WIRING—Every detail for all kinds of wiring, including old buildings, signs, etc. V. TRANSFORMERS — Connections — Operation — Types—Special Forms—Installation. VI. ILLUMINATION—Interior and Street—Types of Lamps, etc. **ORDER YOUR COPY TODAY.**

MODERN PUBLISHING CO., 231 Fulton St., New York



A Specialist is Always Well Paid

especially if there is a good demand for his services. We turn out specialists for a new, unlimited field. We prepare men to handle collections and credits—we practically set you up in business for yourself. Our methods are exclusive, our systems peculiar to our work and results are certain.

CAN YOU DO WHAT 3500 OTHERS HAVE DONE? Over 3500 men in every walk of life have completed our instructions at home, many of them in spare time. These have established themselves in a permanent, growing and highly profitable business—and there are more following in their footsteps. Can YOU do what the 3500 have done?

CAN YOU SUCCEED WITH OVER 3500 HELPERS?

Not only are WE back of you but you will have also the co-operation of the entire system—over 35.0 trained and practical assistants to cover the entire country—over 3500 sources from which to draw new business in your territory. THE CO-OPERATIVE BUREAU is a very fitting name for this organization. You become a member without charge when you finish the course.

W. A. SHRYER
President

THIS COUPON will bring you the synopsis of the entire course—will bring you a wealth of evidence, facts and figures—our ABSOLUTE GUARANTEE is on file with every publisher carrying our advertisements. Use the coupon, that's what it's here for, but be sure and mail it promptly—today is a good time.

AMERICAN COLLECTION SERVICE
595 State St. Detroit, Mich.

C. D. West, St. Louis, Mo.: "I earned net profit $170.00 the first month. Next seven months, average net monthly profit, $342.00."

A. P. Hyde, South Hadley Falls, Mass.: "My commissions, spare time only, for four consecutive weeks, as follows: $31, $54, $78, $100. Will devote all my time to collections."

H. A. Murphy, Youngstown, O.: Commissions for March, $348.02; April, $430.48; May, $439.72 June, 484.58. Expect to double business within next three months."

Coupon, Cut or Tear Off and Mail Today

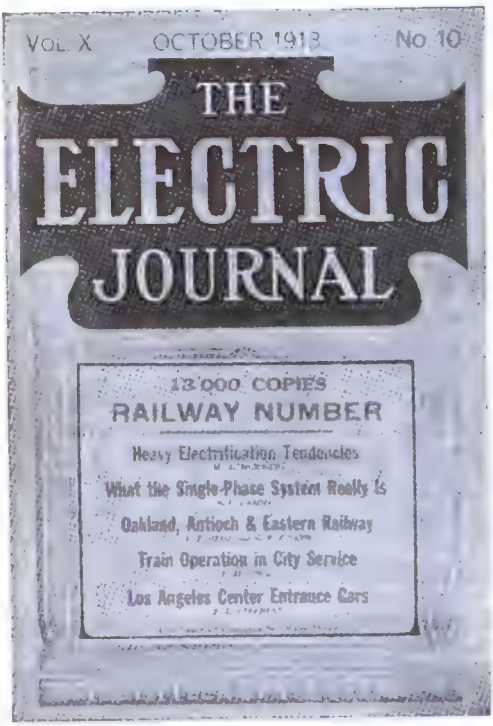
W. A. Shryer, Pres. American Collection Service, 595 State St., Detroit, Mich.—Please mail without cost or obligation to me, the full synopsis of your course; and pointers on the Collection Business.

Name_____

Address_____

Google

DO YOU GET IT?



If not, it will pay you to investigate. The Electric Journal is a practical monthly, published in Pittsburgh, the greatest engineering center in the world. Here is located one of the largest electrical manufacturing concerns. Thus our editors are able to keep in daily contact with many of the most expert practicing engineers, who constitute our large staff of high grade contributors.

The reading pages of the Journal are filled with intensely practical information, written in simple, direct style, for those interested in the generation, transmission and utilization of electric power.

The subscription price is $1.50 per year in the U. S. and Mexico. Canada 25c. extra. Foreign 50c. extra. Single copies, 15c. each.

The Electric Journal

206 Ninth Street, Pittsburgh, Pa.

Electrical Engineering

If you could only realize that this offer places within your reach the results of the experience, exclusively published, of scores of America's most able electrical engineers!

ELECTRICAL ENGINEERING is a great monthly technical magazine for electrical engineers of responsibility. The next 24 issues will bring you over 1,000 pages, covering every phase of electrical work. A veritable encyclopedia. Not a cheap, common or inferior article ever appears.

WHAT 1c. A WEEK WILL DO!

Only $1.00 buys ELECTRICAL ENGINEERING for two years, and copy "Electrical Engineers' Handbook," 414 p., 238 illus.; one of the most valuable hand books ever published at any price.

Or $1.50 buys ELECTRICAL ENGINEERING 2 yrs. and "Questions and Answers on the National Electrical Code," 282 p., 4x6¾ inches. This book is just out. It is by an authority. It tells exactly and plainly what the code requires for every job.

$2.00 buys both books and ELECTRICAL ENGINEERING for two years; the best bargain ever bought, but MONEY BACK IF YOU ASK IT.

This offer will not be accepted through news companies or agents. Old subscribers may take advantage of it by extending their subscriptions two years.

ELECTRICAL ENGINEERING, Grant Building, Atlanta, Ga.

Get Acquainted

With the new sport, motoring for everybody. Learn more about the fascinating little cycle-car, cosy, comfortable, fast and low-priced. Read

Journal of the Popular-Priced Motor Car

Issued monthly, 10 cents a copy; $1 a year; an interesting, beautifully printed and liberally illustrated publication. Subscribe now.

Cyclecar and Motorette
Emigrant Savings Bank Bldg.
New York City

Google

Come and See the CADILLAC TRACT

This body of well located land, possessing responsive and productive soil is situated in the best part of WESTERN MICHIGAN. It is offered in blocks of forty acres or more, with a few pieces, closer to towns in tracts of ten and twenty acres. No description is more than five miles from some good town and railroad, and the bulk of it is closer than this.

The unimproved lands can be bought as low as $20 per acre with some excellent pieces as low as $15 per acre. Very easy terms will be accorded, monthly payments if desired. Taking all conditions into account, location, climate, soil, wide range of crops, pure and abundant water, steady and high priced home markets, good roads and transportation facilities, there is nothing on the market today, that, dollar for dollar can equal them.

In addition to the unimproved lands we own or control a number of improved and partially improved places which we sell at reasonable prices. These places range in price from a few hundred to several thousands of dollars. All can be bought on very easy terms.

Complete and accurate information, illustrated booklet, etc., will be sent free on request to

SAMUEL S. THORPE, Owner,

Room 9, McMullen Block,
CADILLAC, MICHIGAN

100% Annual Income for Life

is the unusual opportunity that is open to a few investors in our **BEARING PECAN ORCHARDS.**

A few 5 and 10 acre Pecan groves containing five and six year old trees which five years from to-day should return you from 30% to 50% annually and increase each year thereafter, and which ten years from to-day should yield you 100% and over annually and continue during your lifetime and that of your children and your great grandchildren. **Far better than Life Insurance.**

THIS IS A GILT EDGED INVESTMENT.—Absolutely safe and unusually profitable. It will yield a good income **NOW.**

IMMEDIATE ACTION

is necessary if you want to share in these bearing orchards.

Actual Size
Paper Shell Pecan

Particulars of Our Monthly Installment Plan, showing how you can purchase a Pecan Orchard on small monthly payments, earning 5 per cent. at the start, with principal doubling in value in 5 years and providing for a permanent life income is given in our pamphlet, "FORTUNES IN PECANS," sent on request.

St. Andrews Bay Nursery & Orchard Co.

2108 Trinity Building 111 BROADWAY, NEW YORK

FILL OUT AND RETURN THIS COUPON TO-DAY

To St. Andrews Bay Nursery and Orchard Co., 2108 Trinity Building, New York.

Without obligation on my part, kindly outline **the best proposition you can offer me** on a planted Pecan Grove for an investment of about ..... thousand dollars.

Name, ...

Address, ...

.....

.....

Digitized by Google

LEADING NEW YORK HOTELS

"THE DOWN TOWN HOTEL"

COSMOPOLITAN
HOTEL

West Broadway and Chambers St.

Within easy access of all subway and elevated railway lines in the city.

ROOMS $1.00 PER DAY and UP
EUROPEAN PLAN

FIRST CLASS
RESTAURANT AND LUNCH ROOM
EXCELLENT SERVICE—FINE MUSIC
PRICES POPULAR

IN THE HEART OF NEW YORK

HERALD SQUARE
HOTEL

34th Street and Broadway

One block from New Penn. R.R. Station. Baggage free to and from this station.

EUROPEAN PLAN

Absolutely Fire Proof, All Modern Improvements

Telephone in Every Room

Rooms, with detached bath, 1.50 per day up
Rooms, with private bath, 2.00 " " "

LADIES' AND GENTLEMEN'S RESTAURANT
GENTLEMEN'S CAFE

UNEXCELLED SERVICE PRICES MODERATE

C. F. WILDEY & SON, Proprietors

THE HOTEL OF AMERICAN IDEALS

Hotel Powhatan

WASHINGTON, D. C.
Pennsylvania Avenue at 18th & H. Sts.

Fire Proof—Germ Proof—Dust Proof
EUROPEAN PLAN

Two blocks from White House and near all points of interest

Rates: ROOMS, Detached Bath, $1.50, $2.00 up.

Rates: ROOMS, Private Bath, $2.50, $3.00 up.

Write for illustrated booklet "B" with small map.

CLIFFORD M. LEWIS, Manager

HOTEL EARLINGTON

27th St. West of Broadway
NEW YORK

EUROPEAN PLAN

A Step from Broadway
Absolutely Fireproof
Quiet as a Village at Night
Your Comfort Our Aim Always

Parlor, Bedroom and Bath, front of house, one person, $2.50; two people, $3.50. Why pay more when our service is equalled only by the best?

SINGLE ROOMS, $1.00

E. W. WARFIELD - - Manager

When writing, please mention "Modern Electrics and Mechanics."

Google

If you are interested in Wireless Telegraphy .

The Wireless World

will give you the latest information relating to the subject.

THE WIRELESS WORLD records monthly the world-wide progress of telegraphy and telephony, and every phase of the subject is dealt with in its columns so that no one, whether he be student, amateur, engineer or commercial man can afford to do without it.

A feature of THE WIRELESS WORLD is the publication of new and revised laws and regulations.

Subscription $1.25 per Annum for United States
" $1.00 " " " Canada

SUBSCRIPTION ORDER FORM

THE MARCONI PRESS AGENCY, LTD.,
51, Marconi House,
Strand, London, W. C., England.

Please supply.....cop.....of THE WIRELESS WORLD monthly, as published, commencing with the.....issue.

I enclose.....value.....being the amount of one year's subscription.

Name .....

Address .....

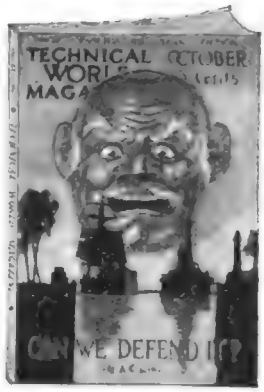
Date..... .....19.....

When writing, please mention "Modern Electrics and Mechanics."

Google

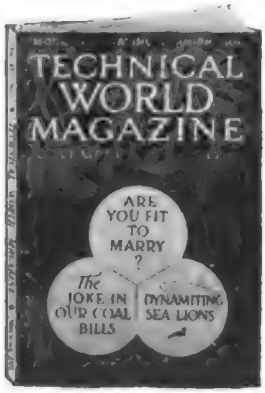
YOU NEED IT

You need it because it tells of the world's advance in a fascinating way all its own—because you cannot keep fully informed without it—because, as Jack London said, there is "Nothing like it," and because, as Luther Burbank said, "It is really indispensable." It tells of things you can find in no other magazine, and yet they are things upon which the future progress of the world is to be founded. It covers fully the discoveries of science, the achievements of inventors, the feats of engineers and explorers, and the opening of every new field of human endeavor.



TECHNICAL WORLD MAGAZINE

"More Fascinating Than Fiction"



You'll like it because it is profusely illustrated—because it tells of things real, living men and women have done or are trying to do—because it tells its true stories in a simple and interesting way—because it makes real achievements, real events interesting—because it shows that the greatest romance in the world is the story of man's ceaseless fight to conquer and use the myriad forces of nature—because it is clean and clear and always far more interesting than the average run of fiction, because it is wonderfully illustrated.

Just Get a Copy and See

On All News-stands
Fifteen Cents Per Copy

By Mail Direct
A Dollar-Fifty Per Year

Flatiron Building, New York—58th St. and Drexel Ave., Chicago

YOU'LL LIKE IT

Digitized by Google

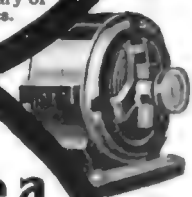
You May Be Another Edison

YOU like Electricity. You want to master it—make it your life work. You want its responsibility—its high pay, its splendid opportunity for advancement.

What is your surest, safest, shortest way to the top? Learn today what the competent, practical instructors in this highly organized school can do for you, because they have done it for thousands of others.

Given only your ability to read and write, the long experience of these splendid teachers, who are authorities both in classroom and actual work, will personally make you a competent and practical Electrical Engineer, Designer, Draftsman, Installer or Repairman. The school itself offers every advanced idea in Electrical Equipment, complete and superior apparatus, class and work rooms in a light, sanitary, modern building, and a complete library of the world's best electrical works and magazines.

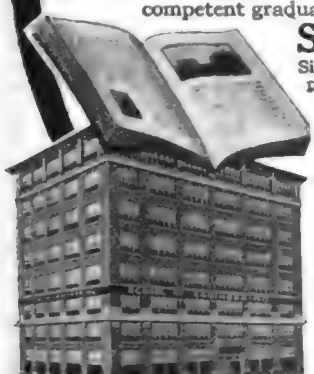
This Is a Real School that Really Teaches You To Become a Money-Making Electrical Engineer



ITS work is personal, practical, positive. For ten years we have been teaching Electrical Engineering in all its branches to young men, fitting them for better positions and higher pay than they could make in any other line of work. Thousands of our graduates, many of whom were of limited means and small education, are holding responsible positions with large manufacturers of electrical goods, with telephone, telegraph and electrical companies, with electric lighting plants and street railway companies—and we have constant demands for more. Here you learn by doing practical work—not by correspondence school methods.

If you like electricity—and are willing to work and study—this school, chartered by the State of Wisconsin, can teach you and fit you to get and hold a position of responsibility with a fine salary. Our Employment Department aids all competent graduates to satisfactory positions.

Send for Free Book This Very Minute



Simply marking the coupon on this page with the branch in which you are most interested may mean a life of pleasant work and good salary instead of hard work with small pay. So mark the coupon N-O-W while you have this before you and send it to us immediately. The free book we will send contains everything you want to know about our school; it describes our courses and tells you about the BIG practical Electrical Engineers who teach you what they have been a lifetime in doing. The big FREE book is YOURS for the asking. Send for it immediately on the coupon to the right.

School of Engineering of Milwaukee
Chartered by the State of Wisconsin
161-169 Michigan St.
Milwaukee, Wis.

"The Electrical School that Graduates Experts"

School of Engineering of Milwaukee,
161-169 Michigan Street,
Milwaukee, Wis.

Gentlemen: Please send me without obligation your free illustrated booklet and full information about what your school will do for me. I am specially interested in

- ☐ Electrical Wiring
- ☐ Telephone Installation and Switchboard Work
- ☐ Motor Dynamo Work and Armature Winding
- ☐ Mechanical and Electrical Drafting
- ☐ Electrical Engineering
- ☐ Electrician Course
- ☐ Day or ☐ Evening Classes
- ☐ Electrical Testing and Meter Work
- ☐ Spare Hour Employment

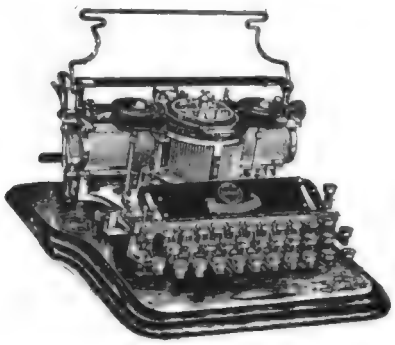
(Check desired subject.)

Name..... Address.....

P. O..... State.....

Google

THE PURCHASER OF A MULTIPLEX HAMMOND CAN DO WHAT OTHER TYPEWRITER USERS WISH THEY COULD DO



The Multiplex Hammond

Visible

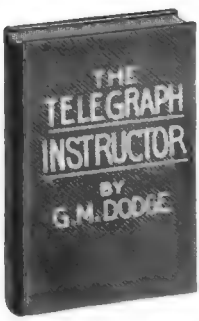
carries TWO STYLES OF TYPE AT ONCE. "JUST TURN THE KNOB" and change instantly from Pica type to Italics, or from English to German, Greek, or any language using different characters.

A FEW OTHER POINTS WHICH MEAN "HAMMOND" exclusively

Durability. The Hammond NEVER wears out.
Machine CANNOT get out of aligument.
No typebars to get loose or bend.
The MOST PORTABLE typewriter made.
Cards and envelopes written without bending.
Writes on any width of paper.
Most beautiful work of any typewriter.

HAMMOND TYPEWRITER CO., Foot of East 69th St., New York City

European Headquarters Hammond Typewriter Co., Ltd., 50 Queen Victoria St., London, E C.



This Big 306 Page Book $1.00

THE TELEGRAPH INSTRUCTOR (fifth and revised edition) covers every branch of telegraphic work (railway and commercial) and is full of the most useful hints and suggestions that have ever been put into printers' ink. It contains complete instructions for setting up telegraph instruments, line construction, manipulation of switch boards, care of batteries, etc. It contains the Morse and Continental Codes in full and hundreds of abbreviations that are in general use. The duties of every railroad and telegraph employee, from the superintendent down to the engineer, conductor and switchman, are fully explained in this big book. It is not only intended for a telegraph student, but is a valuable reference book for the operator.

THE AUTHOR OF "THE TELEGRAPH INSTRUCTOR." Mr. G. M. Dodge, of Valparaiso, Indiana, is an old and expert telegraph operator with years of varied experience in both railway and commercial telegraph service. He is now holding a responsible position with the Western Union Telegraph Company and is President of a large and prominent telegraph school. He is a member of the Old Time Telegraph Association, and is also an associate member of the Association of Railway Telegraph Superintendents. Mr. Dodge is an authority on all matters pertaining to the telegraph.

YOU CAN BECOME THOROUGHLY QUALIFIED for the operating department of almost every railroad as soon as you have mastered the contents of **THE TELEGRAPH INSTRUCTOR**. Train rules, train signals, switch and interlocking signals devices are fully explained and descriptively illustrated in this book. A big lot of other valuable information, such as the block system of handling trains with descriptions and illustrations of modern devices used in railroading, are fully covered in this splendid book.

Sent Prepaid on receipt of price.

MODERN PUBLISHING CO. 231 FULTON ST., NEW YORK

Google

How We Prove the Victor is the Best Typewriter

WE will compare the Victor with any other typewriter—feature for feature—Typebar, Light Touch, Improved Keyboard, Escapement, Ribbon Economy, Mechanical Perfection, Dependability, Visibility—everything that any other machine has and *prove* that the Victor is superior.

The Victor has Improvements and exclusive features that no other typewriter has. Twelve years were spent in perfecting its inch-wide, pivot-bearing typebar.

Does Everything Any Other Typewriter Can Do. Only Better, Speedier, More Satisfactorily.

THE Victor turns out the clearest copy for general correspondence. It makes perfect manifolding. It cuts the sharpest stencils for mimeographing.

Railroads, metropolitan newspapers, great publishing, houses, the biggest corporations, are using the Victor for their intense work because it is the best.

Write for Illustrated Booklet.

VICTOR TYPEWRITER COMPANY

812-814 Greenwich Street NEW YORK CITY

Google

Electrical Engineering

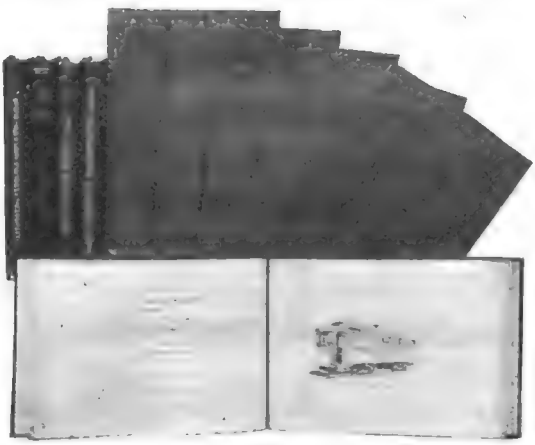
If you wish to earn A BETTER SALARY, here is a chance to get your **diploma** at home during your spare time. **Men in constant demand everywhere. Big salaries** being paid for competent **Electrical Engineers.**

The men who get the **big jobs** are the men who understand the **principles** of electricity and their application.

Our Electrical Course teaches in plain, simple language and with easy lessons how to install and operate electrical machinery and appliances.

These lessons in Practical Electricity cover both Direct and Alternating Currents, high potential and high frequency currents and all that is necessary to become a proficient electrical engineer.

The course completely covers the field of practical electricity including power-plant work, and covers the following subjects, viz.: Practical Electricity, The Electric Motor, Practical Mathematics and Electric Wiring.



FREE

Ten text-books, handsomely bound, printed in large, clear type on fine quality of paper and profusely illustrated, are furnished **free** with this course.

The instruction is made so clear that any one can understand it, even though he has but a limited education.

The success of this school is due to the fact that we give the student only what he should know in order to become competent, and we do not waste his time and effort on useless matter.

Some of the students have been able to complete the course in three months. If you cannot devote much time to study, it will take a little longer.

THE PRICE IS LOW AND THE TERMS ARE EASY

Send the coupon and we will write you at once, giving you complete information and a special proposition.

FREE Cut out and mail the coupon **to-day,** and we will send you FREE **THE DYNAMO.** Shows the consecutive steps in the development of the electric generator, with the construction of the modern generator. Fully illustrated in colors and all illustrations **keyed,** so that an explanation of each part of the same can be seen at a glance. Substantially bound in heavy paper.

Please send me the "DYNAMO," and full information concerning your course in Electrical Engineering.

Name ..... **Street and Number** .....

City or Town ..... **State** ..... **Present Position** .....

SERIES 6-F

THE JOSEPH G. BRANCH SCHOOL OF ENGINEERING
608 South Dearborn St. Chicago, Illinois

Google

This Superb Artist Model Piano Shipped FREE

Yes free, positively and absolutely free. You do not have to pay us a single penny now or later. We merely ask you to accept it on free trial in your home. We do not even ask for any deposit or any guarantee—not even any C. O. D. payment to us. We pay all freight charges to your nearest railroad station. This offer is made direct to you without any middleman's profits, no jobber's profits, no dealer's profits between us and you. You get this superb Evans Artist Model Piano under our direct selling plan from $100 to $200 less than you can buy a cheap commercial piano from your local dealer. Write today—get full particulars of this great offer.

Easy Payments—

Never mind the money. Our low wholesale price and easy payment terms are so very liberal that you never think of the money. This offer places you in the very same position as if you were a dealer; you buy it at exactly the same price as the dealer buys. You do business direct with the factory and get the piano at our low rock bottom price with all middlemen's profits cut out.

No Money Down—

Not one cent on this amazing free trial offer. You do not have to pay a single cent to us unless you decide to keep the piano. If you want to send it back do so at our expense. If you are satisfied with the piano after 30 days free trial and decide that you want to keep it, our easy payment plan is open to you. Take your time to pay for it.

Our Great Offer We, the manufacturers of the Evans Artist Model Piano, will ship direct to you from the factory your choice of any of our artist pianos free. We prepay the freight. You make no deposit of any kind to us. We want you to hear its pure, vibrant tone—we want you to examine its splendid workmanship—we want you to compare the Evans Artist Model Piano with any other piano made. If at the end of the 4 weeks free trial you are not convinced that the Evans Artist Model Piano is the one piano for your home, ship it back at our expense.

Mail Coupon NOW Write today. Get a free copy of our handsome art catalog and full particulars of the greatest piano offer ever made. It means a saving from $100 to $200 on the purchase of a piano. To the first buyer in each locality, we offer a two-years' course in music free. WRITE TODAY—NOW.

EVANS PIANO CO.

DEPT. 494 CHICAGO, ILL.

FREE Coupon

F. O.
Evans Piano Co.
Dept. 494, Chicago, Ill.

Gentlemen — With the understanding that I am not buying anything, you may send me free prepaid a copy of your Art Catalog and full particulars of your direct selling plan.

Name.....

Address.....

Digitized by Google

The Wide World Magazine

10c The Magazine for Men 10c

The delight of young men and of older men with young minds!

All true, stories of adventure, strange customs, travel, heroism. All told in vigorous, snappy style, that makes every page alive with compelling interest.

Get the March Number

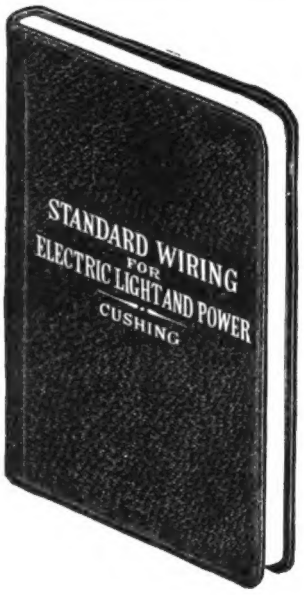
No advertisement can tell what a treat you will have!

Price 10c

Of all newsdealers **Fully Illustrated**

The International News Co., 83-85 Duane Street, New York

Google



20th YEAR 267,000 COPIES SOLD 20th EDITION

"How Easy It Is

to do any kind of electrical wiring and construction work with a copy of Standard Wiring in your pocket."

Anybody can do it with Standard Wiring and every inspector will pass it.

IT TELLS YOU

The latest rulings of The National Board of Fire Underwriters, explained and illustrated, with line cuts and half-tones of the most modern and approved methods.

The latest data on Carbon, Gem, Tantalum, Tungsten and Mazda incandescent lamps.

Simple and complete formulæ and tables, with examples worked out, for direct and alternating current wiring for light, heat and power, for all systems—prepared especially for this year's edition of "Standard Wiring," by the greatest electrical engineering company in the world.

The most carefully selected list of the "One Hundred Best" manufacturers of officially approved electrical apparatus and supplies in this country—showing everything required for any complete installation.

Flexible Leather Cover **Pocket Size** **One Dollar**

Sent Postpaid, any address, on receipt of price.

H. C. CUSHING, Jr., Publisher

63 PARK ROW **NEW YORK**

The Overland Monthly

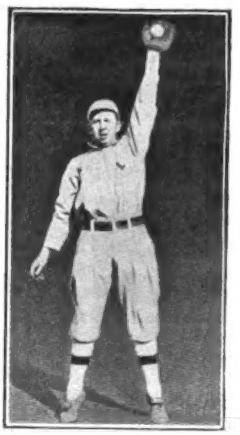
An Illustrated Magazine of the West

LIKE a breeze from the Pacific, it not only covers the Golden State and the Pacific slope more thoroughly than any other magazine, but, sweeping over the mountains with its stirring fiction and graphic delineation of Western life—where the Orient meets the Occident, it carries a charm all its own to the very brink of the Atlantic.

The Overland Monthly Company

21 Sutter St., San Francisco, California

15c a Copy **$1.50 per Year**



FREE!!

6 Handsome photogravure Art Posters in Sepia Brown on heavy white stock 19 x 10 with one year's subscription to the

Baseball Magazine

$1.50 per year—Canadian $2.00

Published the **year round.** On sale 10th of the month, 15c per copy at **all News Dealers.**

Sample Copy Sent FREE on Request

Send us 25c. (stamps or coin) and we will mail you prepaid one of these Art Posters and a Sample Copy. If, after reading sample copy, you decide to subscribe, you need only send $1.25 additional for a year's subscription. WRITE AT ONCE. This offer may be withdrawn without notice.

B. B. Magazine Co., 70 5th Ave., N. Y.

Gentlemen: Enclosed find 25c. for which send me art poster and sample copy of B. B. Magazine, with the understanding if I subscribe for one year, I need only send $1.25 additional.

Name..... Street.....

City..... State .....

Digitized by Google

"Here's what you need—Training"

"Jim, if you want to get ahead in this shop you've got to know more. You're just an ordinary workman now, but you have ability and I'm going to give you some good advice. See this coupon? Well, it wasn't so many years ago that I signed one just like it. At that time I was in the same position you are—holding down a little job at low wages. I was losing ambition every day—had almost concluded that I'd never be anything but an underpaid shop hand, when I happened to notice one of these ad's. I signed the coupon, and the job I hold today I owe to this school."

Yes, it ***is*** good advice. You, no matter if you haven't much of a job and are poorly paid, have ambition and brains and the ability to rise. Other men have become successful, have risen to big jobs and big pay through training. Why not ***you?***

Your Opportunity Coupon

Mark the position you want and mail the coupon now

....Electrical Engineer	....Lawyer
....Elec. Light & Power Supt.	....Bookkeeper
....Electrical Wireman	....Stenographer
....Telephone Expert	....Private Secretary
....Architect	.... Accountant
....Building Contractor	.... Cost Accountant
....Architectural Draftsman	....Cert'f'd Public Acc'nt
....Structural Draftsman	....Auditor
....Structural Engineer	....Business Manager
....Concrete Engineer.	....Fire Ins. Inspector
....Civil Engineer	....Fire Ins. Adjuster
....Surveyor	....Fire Ins. Expert
....Mechanical Engineer	....Moving Picture Op'r
....Mechanical Draftsman	....Sanitary Engineer
....Steam Engineer	....Irrigation Engineer
....Municipal Engineer	....Textile Boss
....Gas Engine Engineer	....College Preparatory
....Gas Tractor Engineer	....Auto. Mechanician

NAME .....

ADDRESS .....

M. E. & M. 3-14

How you can become a trained man

The *American School of Correspondence*, one of the largest educational institutions in the world, was established over sixteen years ago for just such men as you. It is chartered under the same laws as your state university. Through the ***American School*** you can obtain the training and education you need without leaving home—without giving up your work. No matter where you live, the ***American School*** will train you for any position you desire or prepare you for entrance into any resident college.

Then follow this advice and prepare yourself in your spare time for any one of the countless big, well-paying positions always open. Sign the coupon and let us tell you how easy it is. We will not send an agent to bother you in your home or at your work. All business will be carried on privately, by correspondence.

Take the first step—sign the coupon—***now.***

American School
of Correspondence, Chicago, U.S.A.

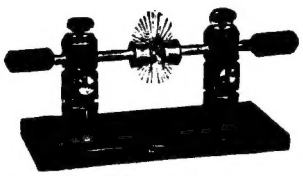
This school has no connection with any other school using the name "American"

Digitized by Google

No. 484. Transmitting Tuning Coil.....$5.10

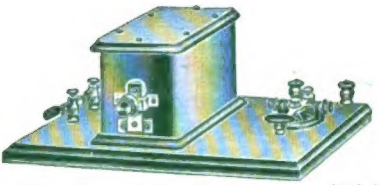
No. 452. Wireless Telegraph Key, Legless....$1.95

No. 417. Flanged Spark Gap.....$4.50



No. 465. High Efficiency Spark Gap.....$3.00

No. 462. Wireless Spark Coil, 1 in.....$5.40



No. 490. Transmitting Outfit.....$12.00

No. 489. Adjustable Primary Condenser.....$5.00

Send for Our New Manual of Wireless Telegraphy C1

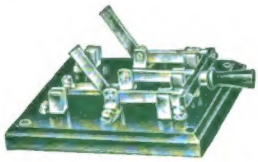
It contains 104 pages and tells how to erect and maintain wireless telegraph stations. Shows a number of diagrams. Has the Morse and Continental Telegraph Codes. Illustrates the best instruments to use; tells what they are for and how to use them. Do not wait until some other time, but sit down now and send your name and address, and get one. It costs you nothing.

Send for Our New Catalog C26

It is pocket size, contains 212 pages, with over 1,000 illustrations, and describes in plain, clear language all about Bells, Push Buttons, Batteries, Telephone and Telegraph Material, Electric Toys, Burglar and Fire Alarm Contrivances, Electric Call Bells, Electric Alarm Clocks, Medical Batteries, Motor Boat Horns, Electrically Heated Apparatus, Battery Connectors, Switches, Battery Gauges, Wireless Telegraph Instruments, Ignition Supplies, etc.

It Means Money Saved to You
to have our Manual and our Catalog when you want to buy

No. 486. Leyden Jar, ½ pint.....$1.05



No. 416. Antenna Switch.$2.00

No. 458. Receiving Set..$7.80

No. 480. Headband with two 1000 ohm receivers.$6.06

No. 440. Fixed Receiving Condensers.....$0.75

Two Books Every Wireless Operator Should Have

AMATEURS' WIRELESS HANDY BOOK . . . . . Price $0.25
LESSONS IN WIRELESS TELEGRAPHY . . . . . Price 0.25

Manhattan Electrical Supply Co.

NEW YORK 17 Park Place — **CHICAGO** 114 S. 5th Ave. — **ST. LOUIS** 1106 Pine St. — **SAN FRANCISCO** 604 Mission St.

FACTORIES—JERSEY CITY, CINCINNATI, RAVENNA, OHIO

Digitized by Google

The Postal Life Employs No Agents

You Deal Directly With the Company

Postal Life N.Y.

Accomplishing a great reform

THE HUGHES' INSURANCE INVESTIGATION OF 1905, found that all life-companies were heavily burdened by **agency-expense** which came out of the pockets of policyholders, of course.

Press and public agreed that the **elimination of the agent was the great reform needed.**

The Postal Life Insurance Company was organized that same year to help work out this very reform.

It has accomplished its part by demonstrating that the business of life insurance can be done **direct;** it has thus transacted business successfully for **more than eight years;** it does not employ agents at all but **gives its policyholders the benefit of the saving thus effected.**

THE FIRST YEAR, policyholders receive a **guaranteed commission-dividend** corresponding to what other companies pay their agents, less a moderate advertising charge.

This dividend ranges up to

40%

of the premium on whole-life policies

In **subsequent years** policyholders can deduct the **entire agents' renewal commission of 7½% and an office-expense saving of 2%,** making up the

Annual dividend of

9½%

guaranteed in the policy

AND, IN ADDITION, the Postal pays, **every year after the first,** the usual **contingent dividends** earned by the policy.

Agents, of course, find it hard to compete with the Postal; they fight it and get certain easily-influenced insurance periodicals to help them.

The public is therefore warned not to take the word of any such agents or to believe the "framed-up" articles that may appear in such periodicals.

The Postal Life is a highly-accredited institution and enjoys the confidence of the well-informed insuring public throughout the country.

POSTAL LIFE BUILDING

Write and find out the exact sum the Company will save *you* at your age on any standard form of contract—Whole-Life, Limited-Payment Life, Endowment, Joint-Life or a Monthly-Income Policy.

Call at the Company's office if convenient, or write for full official information. Simply say:

Mail me insurance-particulars as per advertisement in

MODERN ELECTRICS & MECHANICS for March

In your letter be sure to give:

1. **Your full name.**
2. **Your occupation.**
3. **The exact date of your birth.**

No agent will be sent to visit you: the benefit of his commission goes to you because you deal **direct.**

STRONG POSTAL POINTS

First: *Standard policy reserves,* now nearly $10,000,000. *Insurance in force nearly* $50,000,000.

Second: *Old-line legal reserve insurance*—not fraternal or assessment.

Third: *Standard policy provisions,* approved by the State Insurance Department.

Fourth: Operates under *strict State requirements* and subject to the United States postal authorities.

Fifth: *High medical standards* in the selection of risks.

Sixth: *Policyholders' Health Bureau* arranges one free medical examination each year, if desired.

Postal Life Insurance Company

WM. R. MALONE, President

35 Nassau Street **NEW YORK**

Digitized by Google